

Master Gardener
University of California



The Curious Gardener

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Cruciferous Vegetables: Kids Hate Them, Parents and Doctors Love Them – What About Gardeners?

by Pauline Kuklis, Placer County Master Gardener

If you are a vegetable grower, you have likely heard of cruciferous vegetables, but you may not know exactly what is meant by that term. Perhaps the first thing that comes to mind is broccoli, which is one of the many vegetables in this family. It seems that cruciferous vegetables are almost universally hated by young children, loved by healthy eaters and physicians, while gardeners tend to have a love/hate relationship with them. The years when you have a bountiful and beautiful crop are the love years. But the hate years come when that pesky squirrel eats all the young leaves off



your plants before they have time to grow, or cabbage worms chew the beautiful dark leaves until they no longer resemble their former selves.

So What Exactly Are Cruciferous Vegetables?

In general, these are vegetables within the *Cruciferae* family, and primarily the *Brassica* genus. You may also hear them referred to as cole crops. For the most part, these are cool weather vegetables with flowers that resemble a cross (four petals). We normally eat their flower buds and/or leaves, though in some cases we also eat their seeds or roots. Some of the more commonly known and consumed cruciferous vegetables include:

- Arugula
- Broccoli
- Brussels Sprouts
- Cabbage
- Cauliflower
- Kale
- Radish
- Turnip
- Watercress

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For information on the health benefits of cruciferous vegetables:

<http://nutrition.about.com/od/SuperFoodsSoSuper/f/What-Are-Glucosinolates.htm>

www.cancer.gov/about-cancer/causes-prevention/risk/diet/cruciferous-vegetables-fact-sheet



Photos by Elaine Applebaum

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Health and Nutritional Benefits

If you are wondering why you should grow some of these wonderful vegetables, the answer comes not only in their flavor and diversity in the kitchen, but even more importantly in their health benefits. If you do an online search, you will find various studies that have found all kinds of health benefits from the nutrients contained in cruciferous vegetables.

While not a miracle cure, crucifers are thought to improve the immune system and help keep cancer at bay. They also contain large amounts of many different vitamins and other nutrients needed for a healthy body. To get the most out of your crucifers, eat them raw or just lightly steamed. Boiling or roasting these vegetables will reduce their nutritional benefits. And don't forget about spices like horseradish or brown and yellow mustard seed. Both the leaves of these cruciferous plants and the spices made from their seeds and roots contain lots of healthy glucosinolates and other important vitamins and anti-oxidants.

Growing Crucifers

Most crucifers are cool weather crops. They can be planted in late summer and fall for harvest in late fall and early winter. It is also possible to start seeds indoors in February and/or put out transplants in March for a spring harvest. Planting and harvest times depend upon elevation, as well as the time it takes for a given crucifer to grow from seed to maturity. Some crucifers, like the radish, grow fairly quickly and can be harvested within three to four weeks of planting from seed. Others, such as broccoli, may take two months or more to mature. For these crucifers, you may want to get a head start by sowing seeds indoors or purchasing starter plants at a local nursery. Be sure to stagger your planting every couple of weeks to ensure that you have a nice long harvest season. And don't forget to leave your broccoli stalks alone after cutting the main head – in no time you will have a second harvest of delicious florets. Consult the Placer County Planting Guide to determine when to plant and harvest your crucifers: pcmg.ucanr.org/files/197684.pdf

Cool weather vegetables grow best when they have the right conditions to grow steadily and slowly over time. A sudden heat wave can disrupt their growth and cause them to start producing seeds, often referred to as bolting. Once a vegetable starts to bolt, it will not revert back to its prior form. Instead, the plant will put all its resources into seed production, and nutrients stored in the leaves and roots will be depleted.

To increase your success rate at growing healthy crucifers:

- Mix lots of organic matter, such as worm castings, fish meal and composted animal manures, into your soil before planting.
- Apply a balanced application of fertilizer to your green and leafy crucifers, as they tend to be heavy feeders. The nutrients, especially the nitrogen, will help ensure healthy growth.
- Ensure your crucifers receive water on a steady, almost daily rate. They benefit from constant moisture, but don't let the soil become soggy.
- Test your soil acidity: the ideal soil acidity for cool weather crops is somewhere between pH 6.5 and 7.5.

Pests and Diseases of Crucifers

There are a number of pests and diseases that can harm your crucifers. In addition to the tips itemized above which help keep your vegetables healthy, you can further minimize the impact of pests and diseases by using row covers, rotating your crops each year and making use of companion planting.

Row covers are made of a special fabric that can be draped over your crop to keep pests from laying their eggs where they will subsequently hatch to decimate your vegetables. If desired, you can use hoops to support the fabric, or drape the

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fabric directly over your crop. This can be a very effective way to deter those pesky cabbage worms that absolutely love broccoli, cabbage and other crucifers.

Crop rotation is another way to reduce pests and diseases. Each year, simply change the planting location of each vegetable variety. This technique will help reduce the number of pests and diseases that live in the soil waiting to attack your crop the following year.

Companion planting is a way to plant certain advantageous crops close to one another such that beneficial insects and organisms are attracted, pollination is improved, and pests are controlled naturally. Crucifers in the cabbage family (including broccoli) can benefit from growing close to garlic, onion, beets or celery. Herbs such as rosemary, dill and sage are also beneficial companion plants.

If you have a problem with a pest or disease that is impacting one of your crucifers, consult the UC Davis Integrated Pest Management website: <http://ipm.ucdavis.edu/PMG/GARDEN/veggies.html>

Summary

In summary, every vegetable gardener should include crucifers as a part of their yearly garden. In addition to all the tasty dishes you can make with them, you may also improve your health. Go forth and embrace your crucifers!

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The 12 Bugs of Christmas

by Bonnie Bradt, Nevada County MG and entomologist.

You’ve all heard the classic Christmas song, “The 12 days of Christmas,” beginning with that good old partridge in a pear tree and ending with 12 drummers drumming. Well, leave it to the crazy entomologists to invent a new version. This version was created in 2010, by the then UC Davis apiculturist, Eric Mussen and local photographer Kathy Keatley Garvey, and announced to roaring applause at the annual Christmas party. After all, we all know of MANY other things besides a partridge in that backyard pear tree.

It may be late to be singing Christmas songs, but this version will be one to remember for next year. You have a year to practice. Hope you had a great “BUGGY” holiday season. Here are all the wonderful gifts that the entomologist’s true love gave him/her for the 12 days of Christmas...

The 12 Bugs of Christmas

- 12 deathwatch beetles drumming
- 11 queen bees piping
- 10 locusts leaping
- 9 mayflies dancing
- 8 ants a’milking (aphids)
- 7 boatman swimming
- 6 lice a’laying
- 5 golden bees
- 4 calling cicadas
- 3 French flies
- 2 tortoise beetles and
- A tiny psyllid in a pear tree



Growing in a Greenhouse – Air Circulation, Humidity and Watering

Part Two in a Series by Bonnie Bradt, Rob Chase and Michael Kluk, Nevada County Master Gardeners



Roof vents are critical. They can be operated manually or with automatic openers. Photo by Bonnie Bradt

Air Circulation

The primary purpose of air circulation within the greenhouse is to maintain uniform temperature, decrease relative humidity in the plant canopy, and generate gas exchange between the plant boundary layer and the surrounding air. Where there is no air circulation, temperature stratification and “hot spots” occur, moisture condenses on cooler plant leaves and the glazing surface, and the boundary layer around the plant leaves can become starved of CO₂. Hot spots can cause leaf and fruit burn, pockets of moisture encourage plant disease, and a lack of CO₂ restricts photosynthesis and stunts plant growth. All of these problems can be mitigated by creating a constant flow of air across and through the plant canopy.

The most simple and efficient method of generating air circulation in a small greenhouse is Horizontal Air Flow (HAF.) HAF uses a series of carefully placed fans to create a continuous

directional air flow that has stability and momentum. The optimum range of wind speed in the greenhouse is between 40-100 feet per minute (fpm.) The fans should be rated at 1/4th the volume of the greenhouse in cubic feet per minute (CFM).

Placement of the fans is critical to create a successful air circulation pattern that will require little energy to “kick it along” once the flow is established. Fans should be placed overhead, about 1/4 of the width into the greenhouse, angled slightly toward the center and directed in such a way that the airflow will move through the plant canopy. The first fan should be placed at least several feet away from the end-wall and subsequent fans, if needed, should be placed in a line with the first to pick up and boost the airflow generated by the first fan. The fans on the opposite side of the greenhouse direct the airflow in the opposite direction, creating a “whirlpool” that requires minimal energy to keep moving. In a 300 square foot greenhouse, two 6-inch fans might be adequate to generate the necessary circulation.

In addition to fans, good air circulation can be assisted by using mesh or slatted benches and spacing plants adequately. During cooler periods when the greenhouse is closed, HAF fans should be run 24 hours a day. A successful HAF installation should keep all areas of the greenhouse within 2 degrees of one another in temperature and prevent condensation on both the leaves of the plants and the glazing of the greenhouse.



A fan to circulate air can improve plant health. Photo by Sharon Deen-Darman



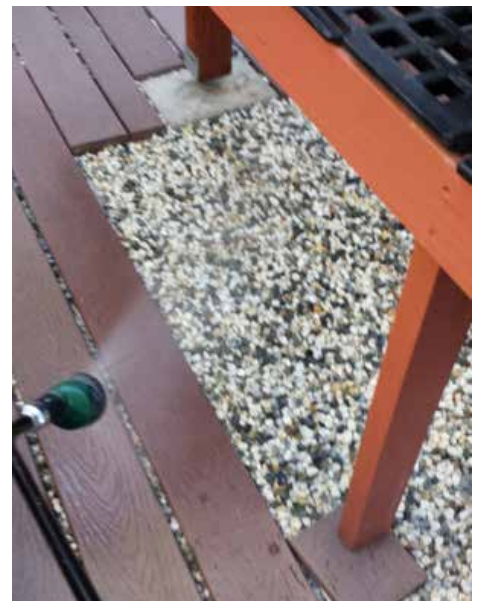
A swamp cooler will provide air circulation and humidity when connected to a water line. Photo by Bonnie Bradt

Humidity

Whether you are a novice or pro in your greenhouse, you may not yet have figured out how to best moderate humidity, or even why it matters. Whether you grow in a greenhouse attached to your home, a freestanding greenhouse, or a cold frame, make sure that humidity is not high enough to potentially damage plants. Even orchids, which may have higher humidity requirements than most plants, do not like to live in air that is too wet.

Moderate watering, early in the morning, is generally enough to raise the humidity to appropriate levels.

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Wetting the floor can help increase the humidity without soaking the leaves and risking fungal spotting. Photo by Bonnie Bradt

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A hygrometer will give you an accurate measurement if you need one. Damage to your plants comes primarily from wet leaves which are an open invitation to the introduction of fungal diseases. The higher the humidity, the more likely it is that condensation will form on leaves overnight when the air temperature drops. Moisture can also drip from overhead structures after water condenses there, or through overzealous watering practices.

The best way to prevent the deposition of excess moisture on the leaves of greenhouse plants is air movement. An exhaust fan or a roof vent open during the day will minimize the chance of condensation developing overnight. You can also leave two open vents, one low and one high, to allow air to move in and out passively although this may be less efficient. Whatever method you decide to use, passive or active, make sure there is adequate air movement and a vent in the roof where hot humid air can exit from the structure.

Watering and Water Conservation

Because overhead watering will encourage fungal diseases, we recommend that you direct water at the base of the plants when possible. Alternatively, you can dip pots or flats into a large container or sink. You can conserve by catching water that runs through your pots in buckets and reusing it. If you have a sink in your greenhouse, you can run the water outside and catch it in a bucket for later use. You can also set up a drip system with ¼ inch tubing and in-line drippers spaced appropriately to water each pot individually. If you are growing in the ground in your greenhouse, use the same water conservation approaches you would outside in the garden. Utilize drip irrigation, water during the cool part of the day, mulch and add organic matter to your soil to retain water.



*Catch rainwater to conserve and provide a source of soft water.
Photo by Michael Kluk*



A sink (photo at right) helps water efficiently. Water can be captured and reused with the proper plumbing (above). Photos by Bonnie Bradt

One of the negatives of a closed greenhouse is that it never rains inside. That may help to reduce water spotting on your prized plants but can eventually become a problem especially if you water with well water because salts from the water will eventually build up in your soil. One solution is to catch water off the roof of your greenhouse. Stored in barrels, it is a source of free water that would otherwise flow away and this soft water will help to clean the soil of salts. A surprising amount of water will fall on the roof of even a small greenhouse during a typical rain storm. Often the biggest problem is having enough large containers available to store it.

Watch the next issue of **Curious Gardener** for continuation of *Growing in a Greenhouse* in which we will cover the important areas of sanitation and lighting.

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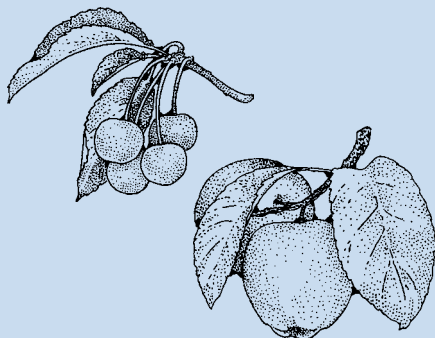
Dormant Season Pest and Disease Management for Fruit Trees

by Bonnie Bradt,
Nevada County Master Gardener

All deciduous fruit trees are susceptible to insect and disease problems affecting fruit quality and tree health. The winter dormant period, which occurs after leaves fall but before buds begin to break open in the spring, is the best time to manage several problems. Key management practices at this time of year are:

- pruning to remove dead, diseased, and broken branches, promote vigor, open the canopy to sun, and improve air circulation
- sanitation to remove mummified fruit on the tree and diseased wood, fruit, and leaves from the ground
- applying dormant oil sprays to control pests
- applying dormant or delayed dormant sprays to limit infection and prevent the spread of certain diseases

To see details of the practices listed above, go to the UC ANR online publication on Winter Pest Management, <http://anrcatalog.ucanr.edu/pdf/8368.pdf>. This Master Gardener Tip Sheet was created by Pam Geisel, former Academic Coordinator for the UC Statewide Master Gardener Program, and Donna Seaver, Program Representative, UC Statewide Master Gardener Program.



Erigeron karvinskianus, Santa Barbara Daisy

by Lynora Sisk, Placer County Master Gardener

I first saw this lovely little daisy at the UC Davis Arboretum. One of the appeals of the Santa Barbara daisy is the multiple colors it displays including a yellow center with pedals that open white and then change to pinkish purple. Sunset magazine also recognized the daisy's appeal and featured it as one of their "9 Beautiful Easy-care Plants."

The Santa Barbara daisy is a perennial forming a low growing mat. It's great for containers or trailing over a wall. Sunset magazine suggests using it as a border in front of tall grasses and the Royal Horticultural Society suggests using it in rock and cottage gardens. By the way, yes, they do grow *Erigeron karvinskianus*, also known as Mexican fleabane, in the United Kingdom.

You can plant this daisy in full sun or part shade where it will provide nonstop blooms from spring through fall. To encourage continuous flowering, grab your clippers and do a little deadheading. For those of you not familiar with "deadheading" it's simply cutting off the flowers as they start to fade.

This Arboretum All Star requires low water and will attract butterflies and beneficial insects. Santa Barbara daisy will spread slowly through self-seeding so, if you want to expand your garden, let some of the flowers go to seed. You can also collect the seed and propagate the plant in pots. During the winter, cut it to the ground to promote new and vigorous growth.

I hope you enjoy this wonderful little daisy. Happy gardening.

References:

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Q & A

By Trish Grenfell, Placer County Master Gardener

I am concerned about the air quality within our home, especially in the winter when windows are not left open. A friend advises that houseplants could help purify the indoor air. Which plants help the most?



The Peace Lily is a top-rated air cleaner, but is toxic to animals and humans if eaten.

Indeed, in our efforts to become more energy efficient in winter, we tighten the hatches down even more, resulting in little inside and outside air flow exchange. According to the Environmental Protection Agency (EPA), indoor air quality is one of the top five environmental risks to public health. Since Space Stations, with their closed environments, similarly experience air quality issues, NASA in 1989 published The Clean Air Study in which scientists examined the impact of 19 common houseplants on three common indoor air pollutants (more toxins were researched at a later date.) As well as absorbing carbon dioxide and releasing oxygen, the study found that all 19 of the houseplants did have the ability to remove some of the pollutants, but certain plants were more efficient at removing specific pollutants than others. For instance, the Warneck dracaena removed 50% of the formaldehyde but only 10% of the trichloroethylene; a chrysanthemum removed 41.2% trichloroethylene and 61% formaldehyde. See http://en.wikipedia.org/wiki/NASA_Clean_Air_Study for plants' toxin removal skill sets. Another study outcome: a plant's roots and its potting soil were also important contributors to the plant's air purifying system. University of Connecticut Extension reports, "Data from a separate two year NASA study showed that when the same plants and potting soil were continuously exposed to air containing pollutants like benzene, their capacity to clean the air improved over time."

The pollutants eventually studied were trichloroethylene, formaldehyde, benzene, ammonia, acetone, ethyl acetate, carbon monoxide, xylene and toluene. These substances are commonly found in building materials, household cleaners, furniture, synthetic carpet, cigarette smoke, furnace combustions, inks, oils, paints, plastics and rubber, gasoline, detergents, pharmaceuticals, varnishes, adhesives, pressed wood products, permanent-press clothes, water repellents, flame retardants, many paper products, natural gas, foam insulation and many more. To understand some negative effects of these pollutants, some of which are carcinogenic, please consult www.ladybug.uconn.edu/CleanerIndoorAir.htm

The heavy hitter plants included in the NASA study which reduced six pollutants: Peace lily (*Spathiphyllum* 'Mauna Loa') and Florist's chrysanthemum (*Chrysanthemum morifolium*)

Plants reducing four to five pollutants: Variegated snake plant, aka mother-in-law's tongue (*Sansevieria trifasciata* 'Laurentii'), Red-edged dracaena (*Dracaena marginata*), English ivy (*Hedera helix*), Lilyturf (*Liriope spicata*), Devil's ivy, aka Money plant (*Epipremnum aureum*), Flamingo lily (*Anthurium andraeanum*) and Broadleaf lady palm (*Rhapis excelsa*).

Plants reducing two to three pollutants: Cornstalk dracaena (*Dracaena fragrans* 'Massangeana'), Barberton daisy (*Gerbera jamesonii*), Dwarf date palm (*Phoenix roebelenii*), Boston fern (*Nephrolepis exaltata* 'Bostoniensis'), Kimberly queen fern (*Nephrolepis obliterated*), Spider plant (*Chlorophytum comosum*), Chinese evergreen (*Aglaonema modestum*), Bamboo palm (*Chamaedorea seifrizii*) and Weeping fig (*Ficus benjamina*).

The NASA study stated that a house would need one healthy plant for every 10' x 10' of your home. A 2000 sq. ft. home would require 20 plants, distributed appropriately.

I now see houseplants as clean air helpers and great holiday gifts. Your gift will be increased with beauty, texture, and best of all—health.



Events Calendar

Nevada County Demo Garden

1036 W. Main St., Grass Valley (on NID Grounds)

Placer County Demo Garden

11477 E. Ave., Auburn (Senior Garden, DeWitt Center)

Nevada County events in **green**; Placer County events in **yellow**

January

January 9

8:30-10:30 am

Composting and Vermiculture

Roseville Utility Exploration Center
1501 Pleasant Grove Blvd., Roseville
Small Fee; register at 916-746-1550

February

February 13

10:00 am-noon

Monarchs and Milkweed— Indivisible

Elks Lodge, lower level meeting room
109 S. School St., Grass Valley

February 20

10:00 am-Noon

Landscape Planning on Paper

Elks Lodge, lower level meeting room
109 S. School St., Grass Valley

February 20

9:00-10:00 am

Dormant Fruit Tree Pruning

10:00-11:00 am

Bare Root Fruit Tree and Perennial Vegetable Basics

Placer County Demo Garden
Cancelled in event of rain

February 27

10:00 am-Noon

Foothill Vegetable Gardening Series: Joy of Vegetable Gardening— Especially for Beginners

Elks Lodge, lower level meeting room
109 S. School St., Grass Valley

March

March 5

10:00 am-noon

Totally Tomatoes: From Seed to Seed

Elks Lodge, lower level meeting room
109 S. School St., Grass Valley

March 12

10:00 am-noon

Foothill Vegetable Gardening Series: Ready, Set, Grow

Elks Lodge, lower level meeting room
109 S. School St., Grass Valley

March 12

8:30-10:30 am

Beginning Composting

Roseville Utility Exploration Center
1501 Pleasant Grove Blvd., Roseville

March 19

9:00-10:00 am

Vegetable Gardening 101: Amend- ing Your Soil and Starting Seeds

10:00-11:00 am

Eureka! Mining Gardening Gold: Composting Tips

Placer County Demo Garden
Cancelled in event of rain

March 19

10:00 am-noon

Foothill Vegetable Gardening Series: Compost is the Gardener's Best Friend

Nevada County Demo Garden

April

April 2

10:00 am-3:00pm

1st Annual Garden Faire

Gold Country Fairgrounds, Auburn

April 2

10:00 am-noon

Water Wise Gardening

Nevada County Demo Garden

April 9

10:00 am-noon

How to Build Raised Beds

Nevada County Demo Garden

April 9

8:30-10:30 am

Intermediate Composting

Roseville Utility Exploration Center
1501 Pleasant Grove Blvd., Roseville

April 16

9:00-noon

Open Garden Day: Tour the Garden and Ask a Master Gardener

9:00-10:00am

Getting Started with Your Vegetable Garden

Placer County Demo Garden

April 16

10:00am-noon

Irrigation Logic in Times of Drought

Nevada County Demo Garden

April 23-24 10:00 am-4:00 pm

**Visit Nevada County Master Gar-
deners at the Home & Garden Show**
Nevada County Fairgrounds

About Master Gardeners

Our mission as University of California Master Gardener volunteers is to extend research-based gardening and composting information to the public through various educational outreach methods. We strive to present accurate, impartial information to local gardeners so they have the knowledge to make informed gardening decisions in regard to plant choices, soil fertility, pest management, irrigation practices, and more.

The Master Gardener volunteer program was started in the early 70's at the University of Washington. Farm Advisors became overwhelmed by all the incoming calls from home gardeners and homesteaders so they trained volunteers to answer these questions and the "Master Gardener Program" was born. The first University of California Master Gardener programs began in 1980 in Sacramento and Riverside counties. The Nevada County and Placer County Master Gardener Associations began soon thereafter in 1983.

Over 30 Years of Serving Placer and Nevada Counties

Production Information

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Have a Gardening
Question?

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