

Missouri Environment & Garden

April 2015

Volume 21, Number 4

Year of the Sweet Pepper

In his quest to find a shorter trade route to the spice-laden East, Christopher Columbus decided to sail in a westerly direction. The land he first encountered was an island in the Caribbean where he found an unfamiliar vegetable being consumed by the indigenous peoples. Its fiery taste was reminiscent of black pepper (*Piper nigrum*), a spice grown in the East Indies that helped prompt his voyage. With the taste connection in mind, Columbus gave the piquant vegetable the name “pepper.”

Sweet pepper often is called bell pepper because of its blocky, campanulate shape. It is noted for its crisp, crunchy flesh and is a variant of the species encountered by Columbus. Since the National Garden Bureau has chosen it as its vegetable to promote this year, 2015 is the “Year of the Sweet Pepper” for gardeners.

Peppers (from the scorching habaneros to the sweet bells) are members of the Solanaceae, or nightshade, family, as are tomatoes, potatoes, and eggplants. Although there are five species of pepper that are cultivated, the most common and the one to which sweet pepper belongs is *Capsicum annuum*.

It appears that all peppers originated in Central and South America. Archeological evidence in Mexico suggests that native peoples gathered wild (hot) peppers as far back as 7,000 B.C. and by 2,500 B.C. they were cultivating them. History does not record when sweet peppers arrived on the scene, but we do know why they are sweet and not hot.

The “fire” in hot peppers is due to capsaicin, a chemical compound produced by most members of the *Capsicum* genus that causes a burning sensation when it comes into contact with mucous membranes. Sweet peppers contain a recessive gene that blocks the production of capsaicin, making them benign from the standpoint of “fire”. Presumably, this recessive gene was the result of a chance mutation in nature that someone discovered and considered to be an improvement to this species.

Most gardeners associate sweet peppers with being green in color. The fact is that, while most sweet peppers start green, all will develop color if allowed to mature fully. This usually takes about ten days following development of full size. Peppers allowed to develop color are higher in vitamin content and sweeter than those that are fully-developed yet green in color when harvested.

Peppers should be planted in the garden in the spring, after all danger of frost has past. They require warmer growing temperatures than tomatoes and typically are planted about two weeks later. Early planting of peppers often leads to poor early fruit set since the latter is hampered at temperatures of 55 degrees F. or less.

When establishing peppers in the garden, it is best to use transplants rather than seeds. Pepper seeds are slow to germinate in cool soil. Space plants 12 to 18 inches apart within rows separated by a minimum of 24 inches. Popular varieties of sweet pepper for the home garden include ‘Revolution’, ‘King Arthur’, ‘Yolo Wonder’, ‘Big Bertha’ and ‘Aristotle’.



Sweet pepper aura and glow. Photo courtesy of the National Garden Bureau.

In This Issue

Year of the Sweet Pepper.....	1
Know Your Tree Fruit, Bud, & Flower Stages.....	2
Biological Control: Using Worms to Control Grubs	3
May Gardening Calendar	4

(continued on pg. 2)

Year of the Sweet Pepper continued.

Peppers perform best with full-sun exposure in a well-drained, loamy soil with a pH ranging from 6.0 to 7.0. Fertilizers with a 1-2-2 ratio (e.g. 5-10-10) can be added to the soil before planting at the rate recommended by a soil test. High rates of nitrogen as a pre-plant should be avoided since it can reduce fruit set. Instead, nitrogen should be added as a side-dressing during the course of the growing season, after a significant fruit-set exists. Since pepper plants have a relatively shallow root system, they are susceptible to moisture stress when rainfall is inadequate. Moisture stress will cause flowers and small fruit to drop. Additionally, it will reduce leaf area, causing the remaining fruit to be sun-scalded. Failure to apply adequate water can also exacerbate a physiological disorder of peppers called blossom-end rot.

Gardeners with limited space might want to consider growing peppers in containers. Their large, glossy leaves, petite white flowers and colorful mature fruit add decorative appeal to patios, decks, etc. Select containers that are at least two gallons in size and fill with a porous, well-drained growing medium. Commercially available mixtures containing Sphagnum peat, vermiculite and perlite are ideal for container production of peppers. Peppers have relatively few disease problems. They can be attacked by several diseases, including bacterial leaf spot, phytophthora, anthracnose and several viruses. When available, choosing a genetically-resistant variety of pepper is the most effective management strategy for controlling diseases.

Insect pests that typically damage peppers in Missouri include European corn borer, pepper maggot, aphids, thrips, stink bugs, spider mites and cucumber beetle.

Whether picked when green or allowed to develop color, peppers should be stored under cool, humid conditions. To avoid chilling injury, do not expose peppers to temperatures lower than 45 degrees F. Long-term exposure to temperatures above 50 degrees F can cause the peppers to change color, lose fresh weight and decay.

Sweet peppers are “powerhouses” of nutrition. One serving (149 grams) of chopped sweet peppers has only 30 calories. Yet it contains 11 percent of the daily minimum requirement of vitamin A and (amazingly) 200 percent of that for vitamin C. Additionally, sweet peppers are good sources of vitamins E and K, potassium, manganese, thiamin, riboflavin and niacin, and very good sources of vitamin B6, dietary fiber and folate.

David Trinklein
University of Missouri
Division of Plant Sciences
trinkleind@missouri.edu

Know Your Tree Fruit, Bud, and Flower Stages

Recommendations for applying pesticides are usually listed by the stage of bud, floral, and fruit development. The reason for this is because certain pests and diseases are often prevalent at specific stages of plant development. Also, some pests are only problematic at specific range of temperatures or after a number of hours in a range of temperatures have accumulated. For example, streptomycin is only applied during bloom and petal fall for fire blight control on apple trees because this is when bees transfer the pathogen to the flowers during pollination and environmental conditions (temperature and moisture) are favorable for infection. Insecticide applications are often targeted to the insect stage when they are most susceptible. For instance, Lorsban insecticide is recommended to control the American plum borer on apple trees at petal fall which is generally the time of peak egg laying of the first brood. It is also important to know the bud stages because certain pesticides, such as dormant oil can cause foliar damage if applied at the wrong time. Lastly, as flower buds develop, they are more susceptible to spring frost injury. Thus, charts have been developed to predict the temperatures at which a range of injury will occur at each floral development stage and are listed in the 2015 Midwest Tree Fruit Spray Guide.

The table below summarizes the floral and fruit developmental stages used for applying pesticides for apple. Peach fruit bud stages for chemical applications include dormant, pink, full bloom, petal fall, shuck split, and fruit set, and are similar to those described for apple. Shuck split is when the dried floral remnant splits away from the developing fruit and is sloughed off after petal fall.

Apple Stage	Appearance of Fruit Bud, Flower, or Fruit
dormant	Fruit bud scales are tight, no green tissue visible from buds
silver tip	Bud scales slightly separated with gray color at tips
green tip	Green leaf tips emerged from buds, about 1-2 mm green visible
half-inch green	When leaves (center one between floral buds on peach) are 1 cm long
tight cluster	Tiny green flower buds are visible on apple
pink	Flower buds tightly closed and pink
full bloom	80% or more of the flowers are open
petal fall	About 75% of petals have dropped off
fruit set	Tiny fruits are visible

Michele Warmund
University of Missouri
Division of Plant Sciences
warmundm@missouri.edu

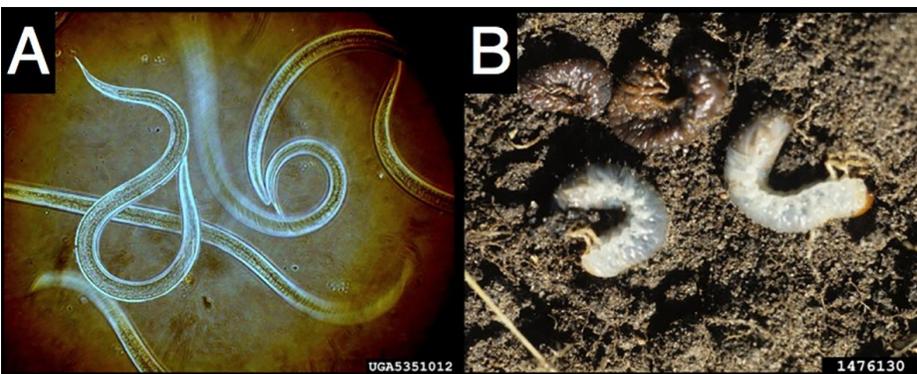
Biological Control: Using Worms to Control Grubs

Nematodes are unnoticed, microscopic roundworms that dominate our living world. While minute, their overall numbers are not. Four out of every five animals on Earth is a nematode, making them by far the most abundant animal on this planet. As nematologist Nathan Cobb explained in 1915, if all the matter on Earth was removed except nematodes, the planet's outline of mountains, trees, and seas would still be dimly recognizable as ghosts represented by the remaining thin film of nematodes.

The variety of nematodes, their life habits, and interactions with other organisms is fascinating and complex. Nematodes need water, so most live in the soil, thin water films on plants, or within their hosts. Nematodes may feed on dead organic matter and detritus, or living organisms such as bacteria, fungi, plants, or other nematodes. Some nematodes have also evolved famously, and often disturbingly, as animal parasites. The animal wrapped around the stake in the medical sign that most think is a snake, may in fact be a nematode. *Dracunculus medinensis* is ingested in drinking water by humans and causes a painful blister infection from a female that may grow up to 4 feet long. The historical treatment was to slit open the affected area and slowly wrap the nematode around a small stick to pull out of the wound without breaking.

Some specific groups of nematode species may also be beneficial, acting as parasites of lawn and insect pests. For example, the annual white grub complex, including larvae from masked chafers, Japanese beetles, and other scarab species, is considered the most important insect pest on home lawns and other turfgrass areas in the state. The life histories of each species may differ, but generally they overwinter as grubs in the soil, and pupate in May to adult beetles. These adults, particularly Japanese beetles, feed voraciously on row crops or desirable ornamentals, and lay eggs in the soil. The new generation of grubs that emerge in late June through early August usually cause the greatest feeding damage on turfgrass roots. Another common and unwanted sign of a large grub infestation is predators such as skunks, raccoons, or armadillos, which will rip up large sections of turf for the easy and plentiful meal.

Soil-applied insecticides are often utilized in early to mid summer for control of an established grub problem. For those wanting another option, however, entomopathogenic nematodes may provide grub control if applied and handled correctly. Two genera, *Steinernema* and *Heterorhabditis*, are voracious parasites of annual white grubs and other specific insect pests. Commercially available products (Grub-Away™ & others) contain *Heterorhabditis bacteriophora*, which can swim through soil water films and actively hunt for its grub host. As a side benefit, *H. bacteriophora* will also infect and kill flea larvae, but will not impact other surface dwelling beneficial insects, you, or the dog.



Entomopathogenic Nematodes for Grub Control

- A. Infective juvenile of *Steinernema scapterisci*.
Source: David Cappaert, Michigan State University, Bugwood.org
- B. Corpses of grubs infected by *Heterorhabditis bacteriophora* (top) & healthy larvae.
Source: Whitney Cranshaw, Colorado State University, bugwood.org

Outlined below are several key factors that are crucial to effectively using nematodes for grub control in home lawns. It's necessary to realize that a living organism is being applied. Therefore, the cost may be higher, and control will not be immediate after application. Proper handling and application is also critical, and the environment must be made suitable for the nematode.

- Grubs must be present in the turfgrass area to be treated. Infective juvenile nematodes will need a food source rapidly after application; meaning curative applications with a known grub infestation are necessary. Spot treatments of affected areas are best. For more information on diagnosis of turfgrass problems, go to <http://plantclinic.missouri.edu/submission.htm>.
- Order the nematodes when you need them, and apply all of them immediately after receipt. This will lessen the chance of any attrition and loss of infective nematodes during storage.
- Nematodes need water. Water the area thoroughly before application. Apply the nematodes in water (sprayer, watering can, etc) and then water them in (at least 0.25") after application. Water daily for the next three days after application, and don't let the soil dry out. Applying in the rain is also a good idea. Yes, your neighbors will look at you strangely...
- Apply during warm temperatures (68-86°F). Exposure to UV and heat may kill nematodes, so do not apply during the heat of the day. Early morning and late evening are the best times to apply.

Lee Miller
turfp@missouri.edu
Ben Puttler
puttlerBe@missouri.edu
University of Missouri
Division of Plant Sciences

May Gardening Calendar

Ornamentals

- Weeks 1-4:** Apples, crabapples and hawthorns susceptible to rust disease should have protective fungicidal sprays applied beginning when these trees bloom.
- Weeks 1-4:** Pinch azaleas and rhododendron blossoms as they fade. Double flowered azaleas need no pinching.
- Weeks 1-4:** If spring rains have been sparse, begin irrigating, especially plants growing in full sun.
- Weeks 1-4:** Fertilize azaleas after bloom. Use a formulation which has an acid reaction.
- Weeks 1-2:** Canker worms (inch worms) rarely cause permanent damage to ornamentals. Use Bt if control is deemed necessary.
- Weeks 1-2:** Don't remove spring bulb foliage prematurely or next year's flower production will decline.
- Week 1:** Continue monitoring pines, especially Scotch and mugo, for sawfly activity on new shoots.
- Week 1:** Begin planting gladiolus bulbs as the ground warms. Continue at 2-week intervals.
- Week 1:** Plant hardy water lilies in tubs or garden pools.
- Weeks 2-4:** Scale crawlers are active now. Infested pines and euonymus should be treated at this time.
- Weeks 2-3:** Plant summer bulbs such as caladiums, dahlias, cannas and elephant ears.
- Week 2:** Begin planting warm-season annuals.
- Weeks 3-4:** Begin fertilizing annuals. Continue at regular intervals.
- Weeks 3-4:** Trees with a history of borer problems should receive their first spray now. Repeat twice at 3-week intervals.
- Weeks 3-4:** Bulbs can be moved or divided as the foliage dies.
- Week 4:** Pinch back mums to promote bushy growth.

Lawns

- Weeks 1-4:** Keep bluegrass cut at 1.5 to 2.5 inch height. Mow tall fescue at 2 to 3.5 inch height.
- Weeks 2-4:** Mow zoysia lawns at 1.5 inch height. Remove no more than one-half inch at each mowing.
- Weeks 2-4:** Apply post-emergence broadleaf weed controls now if needed.
- Weeks 3-4:** Zoysia lawns may be fertilized now. Apply no more than 1 pound of actual nitrogen per 1000 s.f.
- Week 4:** Watch for sod webworms emerging now.

Vegetables

- Weeks 1-4:** Place cutworm collars around young transplants. Collars are easily made from cardboard strips.
- Weeks 1-4:** Growing lettuce under screening materials will slow bolting and extend harvests into hot weather.
- Weeks 1-4:** Slugs will hide during the daytime beneath a board placed over damp ground. Check each morning and destroy any slugs that have gathered on the underside of the board.
- Weeks 1-2:** Plant dill to use when making pickles.

May Gardening Calendar

Vegetables Continued.

- Week 1:** Keep asparagus harvested for continued spear production. Control asparagus beetles as needed.
- Week 1:** Begin planting sweet corn as soon as white oak leaves are as big as squirrel ears.
- Week 1:** Isolate sweet, super sweet and popcorn varieties of corn to prevent crossing.
- Week 1:** Thin plantings of carrots and beets to avoid overcrowding.
- Week 1:** Control caterpillars on broccoli and cabbage plants by handpicking or use biological sprays such as B.t.
- Week 1:** Set out tomato plants as soils warm. Place support stakes alongside at planting time.
- Weeks 2-3:** Place a stake by seeds of squash and cucumbers when planting in hills to locate the root zone watering site after the vines have run.
- Weeks 2-3:** Remove rhubarb seed stalks as they appear.
- Week 2:** Watch for striped and spotted cucumber beetles now. Both may spread wilt and mosaic diseases to squash and cucumber plants.
- Weeks 3-4:** Set out peppers and eggplants after soils have warmed. Plant sweet potatoes now.
- Week 4:** Make new sowings of warm-season vegetables after harvesting early crops.

Fruits

- Weeks 1-4:** Mulch blueberries with pine needles or sawdust.
- Week 1:** Don't spray any fruits while in bloom. Refer to local Extension publications for fruit spray schedule.
- Week 4:** Prune unwanted shoots as they appear on fruit trees.

Miscellaneous

- Weeks 1-4:** Birds eat many insect pests. Attract them to your garden by providing good nesting habitats.
- Weeks 2-4:** Herbs planted in average soils need no extra fertilizer. Too much may reduce flavor and pungency at harvest.
- Weeks 3-4:** Take houseplants outdoors when nights will remain above 50 degrees. Most prefer only direct morning sun.
- Weeks 3-4:** Watch for fireflies on warm nights. Both adults and larvae are important predators. Collecting may reduce this benefit.
- Weeks 3-4:** Sink houseplants up to their rims in soil or mulch to conserve moisture. Fertilize regularly.

Gardening Calendar supplied by the staff of the William T. Kemper Center for Home Gardening located at the Missouri Botanical Garden in St. Louis, Missouri.

(www.GardeningHelp.org)