



Elderberry Rust Defoliating Plants

by Michele Warmund

Bright orange rust pustules are now evident on leaves, stems, and petioles of elderberry plants. These symptoms are caused by the fungus, *Puccinia sambuci*. In central Missouri, symptoms were first observed on elderberry plants on April 1 (Figure 1). With heavy dew, rainfall, high humidity, and temperatures over 50°F, infection will continue and flowers may also become infected.

The life cycle of *P. sambuci* includes five spore types, with pycniospores, aeciospores, and urediniospores occurring on elderberry plants. During summer, urediniospores travel from elderberry plants to the sedge (*Carex* sp.) plants, which is the alternate host. After infection, rust symptoms, appearing as necrotic lesions, are visible on sedge leaves. During late summer, teliospores develop and overwinter on sedge plants. The following spring, basidiospores from sedge plants are carried by the wind back to elderberry plants where the disease cycle continues.

In Missouri, Frank's sedge (*C. frankii*) is a common alternate host for elderberry rust. It typically is found in low, wet areas in a planting. However, eleven other species of sedge are known to serve as an alternate host including Bebb's sedge (*C. bebbii*), button sedge (*C. bullata*), longhair or bottlebrush sedge (*C. comosa*), fringed sedge (*C. crinita*), raven or crow-foot sedge (*C. crus-corvi*), greater bladder sedge (*C. intumescens*), false hop sedge (*C. lupuliformis*), hop sedge (*C. lupulina*), shallow or lurid sedge (*C. lurida*), blunt broom sedge (*C. tribuloides*), and hairy fruited sedge (*C. trichocarpa*).

Research conducted at the University of Missouri found that 'Bob Gordon' elderberry yield was reduced by 31% when young plants had an average of six foliar rust pustules. When unpruned elderberry canes averaged 137 rust pustules on foliage and stems of 'Wyldeewood' plants, infected canes lost nearly twice as many leaves as uninfected canes during the growing season and fruit yield was decreased by 47%. Any rust found on flowering cymes reduced fruit yield (Figure 2). Also, when many pustules caused stem or petiole distortion, flowering and fruiting was also reduced. After harvest, the soluble solid content (i.e., measurement of sugar content) of berry puree was slightly decreased at any level of rust infection, which would require the addition of a greater amount of a sweetener in the final processed product.



Figure 1: Symptoms of rust (*Puccinia sambuci*) on leaflets and petioles of an elderberry plant.

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Radish: Perfect Crop for Impatient Gardeners

by David Trinklein



For gardeners in a hurry to eat the “roots” of their labor, no better vegetable crop exists than radish. Spring varieties are ready to harvest in as little as three weeks after sowing seeds. Most of the later varieties take only four or five weeks from planting to harvest. Whatever a gardener’s level of patience, March and April are ideal times to sow radish in Missouri.

Radish is a member of the Brassicaceae, or mustard, plant family which includes many familiar vegetables such as cabbage, broccoli, cauliflower, etc. The common name radish is derived from the Greek word Rhapsanus. The latter means “quick appearing” or, more loosely translated, “easily reared”.

Radish is believed to have originated in China and is one of the oldest cultivated vegetables. Records indicate that Ancient Egyptians grew radish before the time the pyramids were built. The Greeks valued radish as both a food and medicine. Their high esteem for the vegetable led them to make small gold replicas of radish. Later, the Romans reportedly grew several types of radishes, several of which were similar to the ones we grow today.

Although large types of radish were introduced earlier, the small, Oriental types did not find their way to Europe until the 16th century. Columbus and his fellow explorers are credited with introducing radish

to the Americas. It also was among the crops grown by the first English colonists to our country.

Most people think of radish being eaten raw out-of-hand or in a salad. However, in other parts of the world different types of radish are used in many ways. For example, varieties of radish have been developed from which only the leaves are consumed. Other varieties have been developed for their long seed pods which are eaten. In the Orient, radish is often eaten after being pickled in brine. Additionally, certain types of radish are grown for livestock feed while others have oil-rich seeds.

The rapid-maturing radish for the spring garden are those early varieties which usually have white flesh surrounded by red skin. One of the most popular early varieties is Cherry Belle. It is round, red and ready to eat in about 24 days following planting. Champion and Sparkler are also excellent variety for sowing in early spring. Both are bright red and ready to eat in about three weeks after seeding.

While other good red, round varieties exist, there also are several very useful white types. Snow Belle is very similar to Cherry Bell other than its skin is white instead of red. White Icicle is an excellent older variety with white skin and an elongated root not unlike that of a small carrot. A rapid grower, White Icicle requires

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about a week to 10 days longer to mature than other early types.

For those who like the unusual, there are newer varieties of radish that come in different colors. Black Spanish has white flesh surrounded by dark, blue-black skin. Easter Egg, another newer variety, produces small oval roots in several skin colors including pink, red, purple, violet and white. Regardless of the skin color, the flesh of Easter Egg is white.

Perhaps the most unusual of all radishes is the Chinese heirloom variety Watermelon. It produces roots that are white on the outside with pale green tops. The flesh of Watermelon closest to the root's exterior is white and becomes deep pink or red toward the interior. Depending on when they are harvested the roots can grow to the size of a softball.

Radish is a frost-hardy vegetable that needs cool temperatures to grow best and have the best flavor. Radishes grown in warm/hot weather become pungent or "hot" with age. The latter is due to compounds called allyl isothiocyanates which also are present in horseradish and mustard.

Seeds of radish germinate when soil temperatures are above 45 degrees F. In southern Missouri planting may be started in early March. Mid-March is a target planting date for radish in central Missouri while in northern Missouri, planting can be delayed until late March. Later planting can be done, but the risk of roots developing pungency increases when planting is delayed.

Seeds of radish may be planted up to ½ inch deep and plants thinned to about one inch between plants within rows. Planting wide rows 8 to 12 inches across

is a space-saving way to grow them. To have too many radishes maturing at one time, sow small quantities of seeds at weekly intervals. Roots that are not harvested promptly after maturing tend to become pithy and loose quality.

Since radishes germinate and mature quickly, some gardeners include a few radish seeds in plantings of vegetables such as beets, carrots and Swiss chard. The radishes will help mark the rows of the vegetables slower to germinate and, later, provide extra produce for the family table.

The main insect pests of radish includes aphids and flea beetles. If they become too problematic, insecticidal soaps or other pesticides may be applied to control them.

A frequent complaint from gardeners is their radish have huge, lush leaves but roots that are too small to eat. Most often, this condition is the result of over-fertilization with nitrogen, or planting the radish too late so that hot weather arrives before roots are formed. Radishes will produce a better crop in soils that are not overly fertile. Also, avoid using fertilizers high in nitrogen on soils destined to be planted to radish. A fertilizer high in phosphorus such as superphosphate or bone meal will bolster root development. Additionally, loose, porous soils also allow for rapid root growth and the development of radishes with good size and shape.

Although not quite the nutritional powerhouses that some vegetables are, radish is a good source of vitamin C and contains other essential vitamins, minerals and dietary fiber as well. The average radish contains only 16 calories, making it a good choice for weight watchers.

... Elderberry Rust Defoliating plants continued.



Figure 2: Loss of elderberry flowers due to *Puccinia sambuci* rust infection.

Rust control by non-chemical means is challenging. In small plantings, when there are few rust pustules present, infected elderberry leaflets and stems can be pruned and removed from the site. Since many sedge species are perennial, they tend to be difficult to control. Sedge plants have parallel veins, produce seed on culms (stalks), and spread by rhizomes. Mowing sedge plants before they produce culms will help limit seed dispersal. Repeated applications of glyphosate, especially in the fall, will suppress or control this weed.

MAY GARDENING CALENDAR

Category	Week				Activity
	1	2	3	4	
Ornamentals	x	x	x	x	Apples, crabapples and hawthorns susceptible to rust disease should have protective fungicidal sprays applied beginning when these trees bloom.
	x	x	x	x	Pinch azaleas and rhododendron blossoms as they fade. Double flowered azaleas need no pinching.
	x	x	x	x	If spring rains have been sparse, begin irrigating, especially plants growing in full sun.
	x	x	x	x	Fertilize azaleas after bloom. Use a formulation which has an acid reaction.
	x	x			Canker worms (inch worms) rarely cause permanent damage to ornamentals. Use Bt if control is deemed necessary.
	x	x			Don't remove spring bulb foliage prematurely or next year's flower production will decline.
	x				Continue monitoring pines, especially Scotch and mugo, for sawfly activity on new shoots.
	x				Begin planting gladiolus bulbs as the ground warms. Continue at 2-week intervals.
	x				Plant hardy water lilies in tubs or garden pools.
		x	x	x	Scale crawlers are active now. Infested pines and euonymus should be treated at this time.
		x	x		Plant summer bulbs such as caladiums, dahlias, cannas and elephant ears.
		x			Begin planting warm-season annuals.
			x	x	Begin fertilizing annuals. Continue at regular intervals.
			x	x	Trees with a history of borer problems should receive their first spray now. Repeat twice at 3-week intervals.
		x	x	Bulbs can be moved or divided as the foliage dies.	
			x	Pinch back mums to promote bushy growth.	
Lawns	x	x	x	x	Keep bluegrass cut at 1.5 to 2.5 inch height. Mow tall fescue at 2 to 3.5 inch height.
		x	x	x	Mow zoysia lawns at 1.5 inch height. Remove no more than one-half inch at each mowing.
		x	x	x	Apply post-emergence broadleaf weed controls now if needed.
			x	x	Zoysia lawns may be fertilized now. Apply no more than 1 pound of actual nitrogen per 1000 square feet.
			x	Watch for sod webworms emerging now.	
Vegetables	x	x	x	x	Place cutworm collars around young transplants. Collars are easily made from cardboard strips.
	x	x	x	x	Growing lettuce under screening materials will slow bolting and extend harvests into hot weather.
	x	x	x	x	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.
	x	x			Plant dill to use when making pickles.
	x				Keep asparagus harvested for continued spear production. Control asparagus beetles as needed.
	x				Begin planting sweet corn as soon as white oak leaves are as big as squirrel ears.
	x				Isolate sweet, super sweet and popcorn varieties of corn to prevent crossing.
	x				Thin plantings of carrots and beets to avoid overcrowding.
	x				Control caterpillars on broccoli and cabbage plants by handpicking or use biological sprays such as B.t.
	x				Set out tomato plants as soils warm. Place support stakes alongside at planting time.

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MAY GARDENING CALENDAR

Category	Week				Activity
	1	2	3	4	
Fruits		x	x		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.
		x	x		Remove rhubarb seed stalks as they appear.
		x			Watch for striped and spotted cucumber beetles now. Both may spread wilt and mosaic diseases to squash and cucumber plants.
				x	Set out peppers and eggplants after soils have warmed. Plant sweet potatoes now.
				x	Make new sowings of warm-season vegetables after harvesting early crops.
		x	x	x	Mulch blueberries with pine needles or sawdust.
Miscellaneous	x				Don't spray any fruits while in bloom. Refer to local Extension publications for fruit spray schedule.
				x	Prune unwanted shoots as they appear on fruit trees.
	x	x	x	x	Birds eat many insect pests. Attract them to your garden by providing good nesting habitats.
		x	x	x	Herbs planted in average soils need no extra fertilizer. Too much may reduce flavor and pungency at harvest.
			x	x	Take houseplants outdoors when nights will remain above 50 degrees. Most prefer only direct morning sun.
			x	x	Watch for fireflies on warm nights. Both adults and larvae are important predators. Collecting may reduce this benefit.
			x	x	Sink houseplants up to their rims in soil or mulch to conserve moisture. Fertilize regularly.