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COMMON DISEASES OF ROSE

The rose is often called the “Queen of the Flowers” and is the most popular garden plant in the world. Unfortunately many roses are also susceptible to a number of diseases which lessen their value in the landscape. In Connecticut, the common diseases of rose include black spot, powdery mildew, downy mildew, Botrytis blight, cankers (brand and common canker), rust, crown gall, mosaic, and winter injury. Each year the severity and distribution of these problems vary with the weather, the site, and the type of rose.

Many rose diseases can be effectively avoided or minimized through the combined use of culture, sanitation, resistance, biologicals, and pesticide sprays. For example, there is renewed interest in the old garden roses because of their resistance to many diseases and their winter hardiness. By following an integrated approach, reliance upon one type of control over others is reduced and usually results in effective management of disease.

BLACK SPOT

Black spot, caused by the fungus *Diplocarpon rosae*, is one of the most common and persistent diseases of rose in Connecticut. Symptoms on the leaves are recognized as circular, black spots with fringed margins. These spots are often surrounded by yellow halos. Infections can result in extensive yellowing of leaflets or entire leaves. Yellowed leaves drop prematurely, especially on susceptible cultivars. Plants that defoliate by mid-season are weakened, have reduced flower bud set, poor flower quality, and are susceptible to environmental stresses, particularly winter injury. Symptoms can also develop on canes. They appear as purple-red blotches which blacken with age and develop a blistered appearance. Cankers serve as a means for survival of the fungus over the winter and are important sources of inoculum for new infections in spring. The fungus also overwinters in dead, fallen leaves and plant debris. Black spot is usually most severe in wet weather.

One approach to manage black spot is to plant resistant varieties. However, since there are many strains of the fungus, resistance can be variable. It is therefore important to plant varieties known to be resistant to the strains of the fungus that are present in a particular area. Some cultivars with resistance to black spot are David Thompson, Coronado, Simplicity, Las Vegas, and Cary Grant. Black spot may also be reduced by following a good sanitation program which includes removing infected leaves as soon as they appear during the growing season and raking and removing all fallen leaves and plant debris in the fall. Diseased canes should also be pruned

back to healthy wood in spring prior to budbreak. It is helpful to have sufficient space between plants to ensure good air circulation. Avoiding overhead irrigation or watering early in the day are also effective in minimizing conditions favorable for disease development. Plant vigor should also be maintained by following a program of sound cultural care. Fungicide sprays can supplement other options for black spot control. Among the compounds registered in Connecticut are captan, thiophanate-methyl, chlorothalonil, fixed copper, triforine, sulfur, potassium bicarbonate, and mancozeb. Consult the label for dosage rates and safety precautions. Applications can be made when new growth appears in the spring and continued as long as conditions are favorable for disease development.

POWDERY MILDEW

Powdery mildew, caused by *Sphaerotheca pannosa* var. *rosae*, is a common disease of rose worldwide and is particularly troublesome for glasshouse roses. This disease is recognized by the white, powdery growth on leaves, shoots, and buds. Early symptoms of disease appear as chlorotic or reddish areas or patches on leaves which eventually develop the characteristic white, powdery appearance. This diagnostic, powdery, white growth is usually found on the upper surfaces of leaves but it can occur on both upper and lower leaf surfaces. When newly emerging shoots are infected when young, shoots can be distorted and twisted. Young leaves may curl upward and may be deformed. Flower buds infected with powdery mildew often fail to open. Powdery mildew can develop under relatively dry conditions in spring or midsummer as long as the air is humid and warm. Unlike other fungi that require free water in order to infect, the powdery mildew fungus does not require moisture on the tissues for infection. This fungus also produces small, black, pepper-like resting structures called cleistothecia. These structures serve as overwintering structures and also allow the fungus to survive in the absence of a suitable plant host. Cleistothecia are found in plant debris and are often the primary sources of inoculum in the spring. The powdery mildew fungus can also survive the winter as hyphae or fungal strands in infected buds.

One approach to managing powdery mildew is to plant resistant varieties. However, since resistance can be variable because there are many strains of the powdery mildew fungus, it is important to plant varieties known to be resistant in this area. Some cultivars with resistance to powdery mildew include Tropicana, Double Delight, Sonia, and Queen Elizabeth. Powdery mildew may also be reduced by following a good sanitation program which includes removing symptomatic leaves as soon as they appear. Leaves should be removed and immediately placed in a plastic bag to avoid spread of the powdery spores to other plants. It is also effective to remove all fallen leaves and plant debris in the fall. Diseased canes should be pruned back to healthy wood in the spring, prior to budbreak. It is also helpful to have sufficient space between plants to ensure good air circulation and reduce humidity levels. Plant vigor should be maintained by following a program of sound cultural care. Fungicide sprays can supplement other options for powdery mildew control. Among the compounds registered in Connecticut are thiophanate-methyl, chlorothalonil, triforine, triadimefon, sulfur, potassium bicarbonate, horticultural oil, and mancozeb. Consult the label for dosage rates and safety precautions. Applications can be made when symptoms first appear and continued as long as conditions are favorable for disease development.

DOWNY MILDEW

Downy mildew, caused by the fungus-like organism *Peronospora sparsa*, is a highly destructive disease of rose. Fortunately it is somewhat sporadic in occurrence in Connecticut. Disease development is favored by cool, wet conditions and it can occur in landscape and glasshouse roses. Symptoms can develop on all above-ground parts of the plant including leaves, stems, peduncles, calyxes, and petals. However, leaf infections are the most common and are relatively easy to recognize. Infected leaves develop purple to red, angular spots or blotches which are readily visible on the upper surface. These symptoms are often accompanied by yellowing, necrosis, and premature leaf drop. In some cases, these symptoms can be confused with those associated with contact injury or phytotoxicity due to misapplied pesticides. Defoliation can be extensive when infections are heavy. Under conditions of high humidity, a purplish-gray mass of spores of the pathogen develops on the undersurfaces of the infected leaves. Downy mildew can be distinguished from powdery mildew on the basis of where the sporulation occurs: the downy mildew pathogen only sporulates on the abaxial (lower) surface of the leaf; the powdery mildew fungus usually sporulates on the adaxial (upper) surface of the leaf first but can be found sporulating on both leaf surfaces. Small, purplish-black lesions can also develop on canes and peduncles. These are often confused with those associated with black spot. The pathogen overwinters as mycelium in infected canes and as resting spores (oospores) in plant debris and stems.

Downy mildew can be managed by following a program of good sanitation which includes removing infected leaves as soon as they appear and removing all fallen leaves and plant debris in the fall. Diseased canes should be pruned back to healthy wood in spring prior to budbreak. It is also helpful to have sufficient space between plants to ensure good air circulation and reduce humidity levels. Steps to avoid overhead irrigation and watering early in the day help to minimize conditions favorable for disease development. Plant vigor should also be maintained by following a program of sound cultural care. Fungicide sprays can supplement other options for downy mildew control. Among the compounds registered in Connecticut are copper hydroxide and mancozeb. Consult the label for dosage rates and safety precautions. Applications can be made when new growth first appears and are continued as long as conditions are favorable for disease development.

BOTRYTIS BLIGHT

Botrytis blight, caused by the fungus *Botrytis cinerea*, is a very common disease of rose. This fungus is cosmopolitan and has an extremely broad host range. Symptoms develop on all above-ground parts including flowers, buds, canes, and growing tips. Disease development is favored by periods of cool, cloudy, humid weather. The most diagnostic symptom of Botrytis blight is the presence of grayish-brown, fuzzy growth on the surfaces of infected plant parts. Small, tan flecks or patches appear on flower petals and flower buds. Infected flower buds may droop and fail to open. *Botrytis* can also infect the stub ends of pruning cuts and any wounds from cutting. These types of infections can result in blighting of canes as the fungus produces sunken, tan-brown cankers that girdle the canes. *Botrytis* can effectively survive on all types of plant debris.

Sanitation is critical for management of Botrytis blight and includes removing spent flowers and infected leaves as soon as they appear and removing all fallen leaves and plant debris in the autumn. Diseased canes should also be pruned back to healthy wood in spring prior to budbreak.

It is also helpful to have sufficient space between plants to ensure good air circulation and reduce humidity levels. Steps to avoid overhead irrigation and watering early in the day help to minimize conditions favorable for disease development. Plant vigor should also be maintained by following a program of sound cultural care. Fungicide sprays can supplement other options for control of Botrytis blight. Among the compounds registered in Connecticut are captan, chlorothalonil, copper sulphate pentahydrate, iprodione, mancozeb, potassium bicarbonate, and thiophanate-methyl. Consult the label for dosage rates and safety precautions. Applications can be made when symptoms first appear and are continued as long as conditions are favorable for disease development.

CANKER (BRAND AND COMMON CANKER)

Roses are susceptible to several types of fungal stem cankers. The two most common causal agents are *Coniothyrium wernsdorffiae* and *C. fuckelii* which cause brand canker and common canker, respectively. Both fungi infect through wounds from pruning, insects, and other types of mechanical injuries. Symptoms are confined to the canes or stems and vary in size and other characteristics, depending upon the causal agent. Cankers often begin as small, yellow or dark, reddish spots. The affected areas gradually enlarge and become distinctly brown or reddish-brown in the centers. With brand canker, the canker margin appears reddish-brown or purple whereas common canker has a dark brown margin. Cankered areas are often readily visible from the healthy green of the unaffected portion of the cane. When cankers girdle or encircle a cane or stem, they result in wilting and death of everything beyond the canker. Small, black flecks can develop in the centers of the cankers and are fruiting structures of the causal fungi.

Canker diseases can be managed by following a program of good sanitation. Diseased canes should be pruned back to sound, healthy wood in the spring prior to budbreak. Proper pruning cuts using sharp, clean equipment are important to maximize healing. Equipment can be disinfested with a 10% solution of household bleach (1 part bleach: 9 parts water), 70% alcohol, or one of the commercially available compounds such as Greenshield[®]. Plant vigor should also be maintained by following a program of sound cultural care. It is helpful to avoid injuries and to provide adequate winter protection. Fungicides are not effective for control of canker diseases.

RUST

Rose rust is a fungal disease caused by several species of *Phragmidium*. Symptoms can develop on leaves and any other green parts of the plant. Under favorable conditions, rust symptoms can appear on the entire plant. Small, orange pustules develop on both leaf surfaces in early spring. These gradually enlarge and become more pronounced on the abaxial (lower) surface of the leaf. Chlorotic or mottled areas can also develop on the adaxial (upper) surface of the leaf. These areas usually develop directly over the pustules on the lower surface. Young stems and sepals can also become infected. By late summer or early fall, the pustules turn black and contain the spores for winter survival. Heavy infections can result in premature defoliation. However, cultivars vary greatly in susceptibility and in their reactions to infection. Disease occurs after spores are transmitted through the air, land on leaves and infect the leaves through stomates. Relatively cool temperatures, high moisture, and high levels of relative humidity are conducive for rust development. Rust fungi overwinter on dead leaves, plant debris, and infected canes.

Rust diseases can be managed by following a good sanitation program which includes removing infected leaves as soon as they appear and removing all fallen leaves and plant debris in the fall. “Rusted” canes should also be pruned back to healthy wood in spring prior to budbreak. It is also helpful to have sufficient space between plants to ensure good air circulation and to avoid overhead irrigation or water early in the day to minimize conditions favorable for disease development. Plant vigor should also be maintained by following a program of sound cultural care. When available, it is helpful to plant rust-resistant cultivars or species. Fungicide sprays can supplement other options for rust control and a number of compounds are registered in Connecticut. Lime sulfur is registered as a dormant spray. The fungicides mancozeb, chlorothalonil, myclobutanil, and triforine are effective for control of rust during the growing season. Consult the label for dosage rates and safety precautions. Applications can be made when new growth first appears and are continued as long as conditions are favorable for disease development.

CROWN GALL

Crown gall is caused by the bacterium *Agrobacterium tumefaciens*. This disease is commonly recognized by the presence of galls or swellings on the main stem at or slightly below the soil line. Galls can also form on roots, and more infrequently, on aerial portions of the plant. Crown galls are often irregular in shape, have no internal structure or organization, and vary in size. Young galls are light green or off-white and soft. As these galls age, they darken to brown or black and become hard and woody. Roses infected with crown gall react in many different ways. Some plants appear stunted, others have poor foliage and produce few flowers or flowers of poor quality, and others are killed. The locations of the galls appear to have a significant impact on the symptoms exhibited by the infected plant. For example, a single gall at the base of a stem may be more damaging than several galls located on roots or aerial canes. The bacterium infects through wounds (e.g., from pruning, cultivating, insect chewing, or heaving in frozen soil). It can also be transmitted by wounds made with infested tools. Crown gall bacteria survive in galls and in the soil without a plant host for at least two years.

Prevention and sanitation are critical for managing crown gall. It is important to use healthy, disease-free transplants and to carefully inspect plants prior to planting. It is helpful to avoid injuries to the roots and crown during planting and cultivating. Canes with galls can be pruned back to sound, healthy wood. Proper pruning cuts using sharp, clean equipment are important to maximize healing. Equipment can be disinfested with a 10% solution of household bleach (1 part bleach: 9 parts water), 70% alcohol, or one of the commercially available compounds such as Greenshield®. Rootstocks differ in their susceptibility to crown gall. Among the more resistant types are *Rosa multiflora* and *R. manetti*. Plant vigor should also be maintained by following a program of sound cultural care. Control of crown gall with biological control agents has yielded mixed results. The bacterium *Agrobacterium radiobacter* strain K84 is registered for biocontrol and has occasionally been successful as a preplant dip or spray. There are no effective chemical controls for this disease.

MOSAIC

Rose mosaic is caused by a complex of several viruses including Prunus Necrotic Ringspot Virus (PNRSV) and Apple Mosaic Virus (AMV). Symptoms are highly variable and depend upon time of year, temperature, species, cultivar, and the specific viruses infecting the plant.

Characteristic leaf symptoms appear as wavy or zigzag, chlorotic lines but symptoms may also appear as ringspots and mottled patterns. Yellow watermarks, vein clearing, or dull yellow blotches may also be indicative of infection. Some infected plants may appear stunted and weak and others may show no symptoms at all. Reductions in flower numbers and size, distortion, and reduced winter hardiness have also been reported to be associated with infection. Symptoms are often most pronounced in spring and early summer and may not be present in summer, possibly due to temperature. Rose mosaic is not readily transmitted in nature since no insect vectors have been identified. However, it is spread when infected buds, scions, or rootstocks are grafted onto healthy plants. Once plants are infected with rose mosaic, they cannot be cured.

Rose mosaic can be avoided by purchasing healthy, certified virus-free planting material. It is also prudent to scout for symptoms on a regular basis and to remove and destroy infected plants as soon as they are identified.

WINTER INJURY

Winter injury results from many environmental factors which have little in common other than they occur during the winter. Examples include late spring frosts, cool summers followed by warm autumns and sudden drops in temperature, dramatic temperature fluctuations, freeze-thaw cycles, lack of snow cover, unusually warm midwinter temperatures, extended periods of extreme or abnormally cold temperatures, and drying winds. Winter injury is important in and of itself but it also predisposes and weakens plants and subsequently makes them more vulnerable to secondary or opportunistic pests. Another important characteristic of winter injury is that quite often the symptoms are not evident until sometime after the injury has occurred. Symptoms of winter injury are highly variable and are manifest as buds that fail to open in spring or shoots that wilt and collapse shortly after emergence or suddenly collapse during the heat of the summer. In some cases, canes are blackened and dead by spring.

Winter injury can be minimized by maintaining plant vigor by following a program of sound cultural care. For example, one of the most effective defenses against winter injury is to stop fertilizing early enough in the season so the plants have a chance to go into natural dormancy. In spring, any dead canes which can serve as sites for secondary invaders or opportunistic pests should be pruned and removed from the planting. Winter protection in the form of winter mulching is also helpful for bud-grafted plants such as hybrid teas. It is usually not necessary for species, shrub, old garden, or climbing roses. Roses can be mulched with loose soil, compost, or leaves mounded around the base after the first hard frost. The goal is to protect the bud union from the weather extremes of the winter. Winter mulch should be removed in early spring when new growth begins. It is also important to select cultivars or species of rose that are known to be hardy in Connecticut.

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