

# 30. Crown Gall of Cottonwood, Willow, and *Prunus* Species

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Species of cottonwood, willow, and *Prunus* are commonly used in windbreak plantings in the Great Plains Region. Many of these species are susceptible to crown gall disease caused by the bacterium *Agrobacterium tumefaciens*.

## Hosts and Distribution

Crown gall occurs worldwide on numerous tree hosts, including both broadleaf and conifer species. De Cleene and De Ley (1976) list 643 host plants belonging to 331 genera and 93 families. Most members of the genera *Populus*, *Salix*, and *Prunus* are listed as susceptible to infection by at least one isolate of *A. tumefaciens*. Exceptions are *Populus canadensis* cv. *serotina erecta*, *P. robusta*, *Prunus caroliniana*, *Prunus divaricata*, and *Prunus ilicifolia*, which appear resistant. While not all of these species may be adapted to the Great Plains region, they could be considered as sources of resistance, providing that their resistance is tested with local isolates of *A. tumefaciens* from the same host genus.

Certain species of *Juniperus*, *Cupressus*, and *Libocedrus* have been reported as susceptible to the crown gall bacterium. Crown gall occurs on eastern redcedar seedlings in some Great Plains nurseries.

## Symptoms and Signs

Individual swellings or galls may form on the aerial portions of the tree (fig. 30-1), or on roots (figs. 30-2, 30-3, 30-4). The galls usually are rounded with rough, irregular surfaces that darken with age. Galls vary in diameter from less than 1 inch to more than 1 foot.

Internally, the galls show irregular structure, with the various tissue elements being disrupted.

Several insects and mites, and physiological responses to grafting or wound regrowth may cause similar-looking galls. The particular diagnostic characters of crown gall are the rough, irregular surface and the lack of small holes (caused by insects) in the core of the gall itself.

The bacterium can be identified by techniques outlined by Schaad (1980).

## Disease Cycle

*A. tumefaciens* is found in the soil, and apparently enters the plant through wounds resulting from cultivation, root pruning, or insect feeding. The bacterium may also be spread through use of contaminated pruning or grafting equipment. After entering the plant, a portion

of the bacterial genetic material is transferred to the host, resulting in abnormal cell growth and cell numbers in that region of the host tissue. The resultant swollen tissue forms the gall. Young trees, such as nursery stock, may be stunted when the woody tissue is disrupted, preventing flow of water or nutrients. The bacteria re-enter the soil, probably through disintegration of the gall.

Chewing insects can carry the bacteria from plant to plant, while long-distance movement is by infected nursery stock.

Symptoms may not appear for several weeks after infection, depending on weather conditions. Warm weather favors this disease. The bacteria may survive for two years in soil without a host, but may survive longer in decaying galls. Crown gall is favored by soils of neutral or higher pH.



Figure 30-1. Weeping willow with aerial crown galls.

## Damage

Infection of large trees is infrequent and results in no economic loss. Infection of nursery stock, however, can be quite extensive, especially when inoculation takes place during propagation. Small trees may be stunted. Normally, in most states there is no tolerance for nursery stock infected with crown gall; all infected plants are destroyed. Subsequent monitoring losses may be high.

### Control – In nurseries:

1. Select planting wood or propagation stock from wood free of crown gall.
2. Use care during propagation to avoid transmitting the bacteria from diseased to healthy wood.
3. Sterilize cutting instruments frequently using a disinfectant such as 70 percent alcohol.
4. In species that are vegetatively propagated, use a budding technique rather than grafting.
5. Avoid mechanical wounds of young trees or bushes.
6. Remove and destroy all infected plants.
7. Plant where a non-susceptible crop has been grown for at least 2 years. Growing oats, corn, or a grass crop prior to susceptible crops will reduce crown gall.



Figure 30-3. Galls formed on roots of pecan (left).

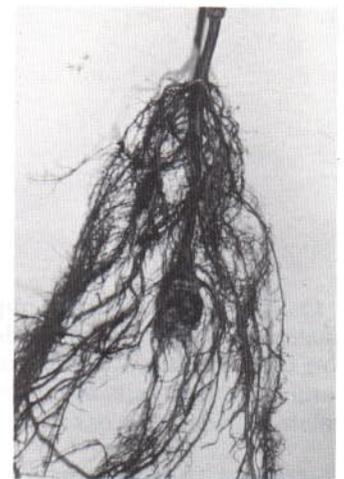


Figure 30-4. Galls on roots of eastern redcedar nursery stock develop at wound where roots were pruned (right).

### Control – In general:

1. Infested soil can be treated either with heat (180°F for 30 min) or by soil fumigation (such as methyl bromide or other fumigants). Exposure to moist heat at 150°F for 30 minutes will destroy many plant pathogens, insects, and weeds.
2. Dipping understocks in disinfectants or antibiotics (such as terramycin) can be effective.
3. A biological control has been shown to be effective utilizing a related bacterial species *A. radiobacter* (Strain 84), which is antagonistic to *A. tumefaciens*. Nursery stock is dipped in a solution of live bacteria before planting. The antagonistic bacteria produce a toxin that prevents infection by *A. tumefaciens*. This treatment should be effective in large plantings such as nurseries if crown gall is a chronic problem.
4. The best control is to plant disease-free stock.

### Selected References

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Figure 30-2. Galls on surface of roots of eastern cottonwood.