



# Crown Gall of Woody Plants

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**C**ROWN GALL is a widely prevalent and destructive disease that occurs on a wide variety of plants including at least 145 genera within 61 widely separated plants families. We here are, of course, more familiar with crown gall on shade, fruit, and nut trees, and on woody and herbaceous ornamentals.

The disease is caused by the bacterium *Agrobacterium tumefaciens*. The organism enters the plants only through wounds. Direct penetration through uninjured plant tissues has not been reported. The most common site of gall development is on the roots of the crown area, but galls may also appear on stems and other above-ground plant parts such as occur on quince, apple, rose, euonymus, willow, and poplar, to name a few.

Severity of crown gall disease depends on several factors:

- 1) species infected,
- 2) location and number of infections,
- 3) size of the galls — incidentally, galls can vary from size of a pea to galls that weigh 50 to 100 pounds.
- 4) and whether or not secondary infections have occurred.

How does the disease affect the

plant and what is the economic impact of the disease to the grower?

Crown gall can reduce the productive life of plants by weakening the stems, disrupting the translocation system, predisposing them to secondary pathogens, and producing a general decline in vigor. Secondary fungus infections from galls in the crown area often result in heartrots which cause trees to die or fall over. For example, hundreds of almond trees in California die or are blown over every year due to heartrot caused by crown gall infections which occurred many years earlier.

Crown gall is a primary cause of condemnation of nursery stock. Substantial losses are sustained by nurserymen discarding trees and shrubs infected with crown gall. A 1963 report estimated that losses in California orchards alone exceeded \$6 million annually. Undoubtedly, this figure today approaches the \$10 million mark. The disease often is initiated right in the nursery when planting liners, propagating, harvesting, or during procedures that may injure the plant; however, it can occur anytime during a plant's life. Since the disease is generally considerably more serious when infection occurs during the first 3

years after planting, extra precautions must be taken to avoid wounding during this period.

How can the grower prevent and control crown gall infections?

1. Avoid wounds during planting, cultivating, and digging.
2. Use disease-free stock — that is, inspected and certified stock.
3. Dip plant stock — since there are many opportunities for apparently disease-free stock to be carrying the bacterium, dip the roots in a bactericide prior to planting.
4. Extreme care should be used in grafting to avoid transmission of the bacterium from one plant to another.
5. Rotate crops and select clean ground. Fumigate, if necessary.
6. Use sanitary practices — avoid mixing diseased and healthy nursery stock at digging time. Destroy diseased stock as soon as possible. Avoid transporting contaminated soil to clean ground.
7. Surgery — remove galled tissues completely.
8. Use resistant plant material whenever possible.

9. Treat galls with a chemotherapeutic agent.

I would like to elaborate on this last point. There is now commercially available a product called **Bacticin** which appears to have a high affinity for galled tissues and causes a selective degeneration of the tumors.

In a study conducted at the Shade Tree Laboratory in Delaware, aerial galls on six-month-old Sherrill hybrid poplar rooted cuttings were treated directly with undiluted **Bacticin**, which is a coordination product of two hydrocarbons, 2,4-xyleneol and metacresol. The trees were treated three times during the growing season and then placed in a lath house to overwinter and examined approximately one year following the last treatment. We treated comparable groups of galled plants with either streptomycin SO<sub>4</sub> or water. These served as our checks or controls.

One year following treatment 47% of the **Bacticin** treated trees were regarded as healthy — that is, the main leader was alive and there wasn't any visible evidence of renewed gall development. On the other hand, only 4-5% of the streptomycin SO<sub>4</sub> and water treated plants were categorized as healthy. Most trees were either killed outright or the main leader was dead and sprouts were developing below the gall. About 90% of the trees in the streptomycin SO<sub>4</sub> and water treated groups fell into these two categories.

**Bacticin**-treated trees show three types of responses:

1. inhibited and gall degeneration
2. inhibited gall, but tumor remaining essentially intact
3. inhibited gall from last year, but new gall formation

In summary, **Bacticin** gave approximately a 10-fold increase in the number of healthy plants over the streptomycin SO<sub>4</sub> and water treatments. Furthermore, **Bacticin** appears to have a high affinity for galled tissues and definitely possesses chemotherapeutic properties.

By utilizing materials which possess curative properties and by strictly observing the fundamental principles of preventative medicine, losses from crown gall can be greatly minimized. Is it worth the added effort and cost? I think it is. Just ask any nurseryman who has had to dispose of large quantities of nursery stock because of crown gall disease!

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