

# W alnut and butternut toxicity

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Black walnut (*Juglans nigra*) and butternut (*Juglans cinerea*) trees produce toxins capable of stunting or even killing susceptible plants.

Walnut or juglone toxicity is not fully understood; however, root contact or close proximity between walnut or butternut roots and susceptible plants is essential for the problem to develop. It once was thought that drippings from tree foliage might be responsible for the problem, but this theory has since been disproven.

Not all *Juglans* species produce this toxin. The southern black walnut and the northern California black walnut are not known to cause this problem. Neither the Persian nor the English walnut is problematic, unless grafted onto rootstock of one of Wisconsin's two native *Juglans* species.

## Symptoms

Symptoms of walnut toxicity range from stunting, to partial or total wilting, to death of the affected plant. Frequently, susceptible plants in the home garden may be growing quite well, when in just a day or two they suddenly wilt or die. In an all too frequent scenario, a homeowner plants a successful garden for several years near a young black walnut or butternut tree. Then one year, susceptible garden plants nearest the tree become affected. Each year more of the garden suffers until it becomes impossible to grow plants such as tomato or potato. With herbaceous plants the wilt closely resembles a wilt caused by a bacterial or fungal pathogen. For example, symptoms on tomato include yellowing of foliage, twisting, and internal discoloration; these symptoms are identical to those of *Verticillium* or *Fusarium* wilt.

## Factors involved in the toxic action

According to a 1967 study, the toxin juglone—the toxin responsible for walnut toxicity—acts on susceptible plants by inhibiting respiration; the plant simply cannot breathe properly.

While juglone is present in the leaves, fruit hulls, bark, and roots of walnut and butternut trees, a problem usually arises only when roots of these species are in very close proximity or contact with the roots of susceptible plants.



Cotoneaster hedge showing effects of walnut toxicity. Note that shrubs are gone where there was root contact. The shrubs next to the trunk are unaffected because there are no roots in the area.



Tomato plants showing wilting due to walnut toxicity.

The toxin apparently is not secreted from the *Juglans* roots into the surrounding soil. Instead, the current theory suggests that the susceptible plant draws the toxin out of the root tissue. Thus, if the soil is removed from the root zone and all roots of the *Juglans* species are carefully screened out, susceptible plants can thrive in this soil. But when the bark or root pieces are incorporated into soil, susceptible plants wilt rapidly as their roots contact *Juglans* tissue. As a result, when black walnut and butternut trees are removed, the remaining root pieces will continue to cause problems until the toxin breaks down.

### Species affected

Plant species most commonly affected by juglone are tomatoes and potatoes. These species are deep rooted and common garden plants, a combination which makes the phenomenon highly observable. Alfalfa is also very susceptible to juglone. And some apple varieties are killed, while others are dwarfed or killed just on the side nearest a walnut tree.

Rhododendron, white pine, red pine, white birch, cinquefoil, and cotoneaster are other species known to be affected by black walnut or butternut. Undocumented reports of gardeners in the state suggest that beans and cucumbers also have been affected.

Not all species are harmed by the toxin. In fact, many species not only survive but appear to do better under black walnut and butternut trees. Kentucky bluegrass, orchardgrass, wild hydrangea, red clover, and wild grape are a few of these species. Black raspberry thrives, while the closely related blackberry is quite susceptible.

### Control

Both black walnut and butternut grow in Wisconsin. These trees are relatively fast growing, make satisfactory landscape trees, and produce edible nuts. If faced with choosing between a tree or a garden, remember that chopping down a tree is not the immediate solution, unless all root pieces are painstakingly removed.

Barriers to root growth may be an alternative to tree removal. Where susceptible species survived alongside wilted ones, it was observed that a rock or old concrete foundation had kept the tree roots from contacting the susceptible plants. Placing a wood or concrete barrier in the soil between your tree and the garden may separate the roots.

If you have a walnut and butternut toxicity problem because of present or past tree plantings, limit your garden selections to relatively shallow-rooted species. Tomatoes and potatoes are deep rooted and very susceptible to juglone. Frequent light waterings will promote shallow rooting and may help alleviate some problems.

If you're landscaping a new home site and you want both a walnut or butternut tree and a garden, plant the tree in the front yard and the garden in the rear. Do not use the leaves and husks as mulch for your vegetable garden.



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