



Juglone and Black Walnut: A Toronto Master Gardeners Guide

Are the tomatoes in your neighbour's garden doing much better than the ones you planted next to your black walnut tree? The problem may be due to juglone, a chemical naturally produced by the black walnut tree. The largest amount of this chemical is found in the buds, hulls of nuts and roots with smaller amounts in the leaves and stems.

Life Cycle and Habits

When a plant produces a chemical that inhibits the growth of another, an allelopathic relationship exists between these plants. Juglone inhibits the respiration of sensitive plants. Sensitive plants are deprived of the energy they need for their metabolic functions. The small amount of juglone that is released from the live roots will affect sensitive plants. Juglone is not very water soluble and, for this reason, does not move very far in the soil. However, roots can extend 15-18 m (50-60 ft) from the trunk of a mature black walnut tree and, because of this, juglone can affect vegetation for a considerable distance from the tree.

Juglone is also found in decaying nut hulls, leaves, stems as well as the roots, so the entire area under the canopy of the tree (with dense roots) can be particularly problematic. It is possible, however, that plants closer to the trunk may not be affected or show a reduced response.

Symptoms of Juglone Damage

Species that are sensitive to juglone will exhibit symptoms such as wilting and yellowing of the foliage. For many species juglone will result in the death of the plant. Symptoms will begin to appear when the black walnut tree is seven to eight years old.

Plants Affected by or Tolerant of Juglone

The following is a guide, but not a definitive list, of plants that appear to be either particularly affected by or tolerant of juglone.

Plants that are very affected by juglone include:

- Tomatoes
- Alfalfa
- Apple
- Pear
- Blackberry
- Blueberry
- Mountain laurel
- Azaleas
- Rhododendrons
- Potentilla fruticosa
- Red pine
- White pine and
- Other evergreens

Plants that occasionally show symptoms of juglone include:

- Sweet peppers
- Viburnum
- Autumn crocus
- Peony
- Crab-apple
- Magnolia
- Red raspberry
- Peach
- Euonymus spp.
- Common lilac
- Persian lilac (this may be a situation where soil conditions make a difference)

Some of the perennials that will tolerate juglone include:

- Anemone
- Lilyturf
- Jack-in-the pulpit
- Blue grass
- Lady fern
- May apple
- Solomon's seal
- Dog's tooth violet
- Christmas fern
- Willow gentian
- Primulas
- Pilewort
- Hellebores
- Nightshade
- Coral bells
- Meadow rue
- Hosta
- Toad lily
- Iris
- White clover
- Trillium
- Ostrich fern
- Bellwort
- Forget-me-not
- Periwinkle
- Kentucky Blue Grass



Black walnut (*Juglans nigra*) is simply practising self-preservation. It produces juglone in order to reduce the competition from other plants for soil nutrients.

Photo: Helen Battersby

Some of the trees, shrubs and vines that will tolerate juglone include:

- Maples
- Mock orange
- Hickories
- Oak
- Burning bush
- Rose species
- Forsythia
- Black raspberry
- Red Cedar
- Lilac
- Honeysuckle
- Viburnum
- Virginia creeper
- Grape

Some tolerant annuals include:

- Impatiens
- Rudbeckia
- Salvia

Vegetables that will tolerate juglone include:

- Lima beans
- Snap beans
- Beet
- Sweet corn
- Onion
- Parsnip

Bulbs that are tolerant to juglone include:

- Tulips
- Crocus
- Snowdrops
- Grape hyacinth
- Narcissus

Organic Management and Control Strategies

If possible do not plant gardens or beds near black walnut trees to avoid damage to susceptible species. If planting near a black walnut tree use species that are tolerant of juglone.

Consider using raised beds if planting near a black walnut tree. However, if tree roots penetrate these beds the problem may continue to exist, depending on the species chosen.

Remove all litter in the garden from black walnuts trees (e.g. leaves that blow into the garden in fall). Do not mulch with decaying leaves, stems, nut husks, bark, chips etc. from black walnut trees since juglone may continue to exude from this composted organic matter.

Tree removal may be considered, however removal may not eliminate the impact on sensitive plants, due to the decaying roots that continue to release juglone for some time after the tree is removed.

Cautions/Considerations

The detrimental effects of juglone on neighbouring plants may depend on soil and moisture conditions. Excellent drainage is associated with decreased response to juglone. If planting near a black walnut tree every effort should be made to enhance soil drainage.

Toxicity may persist for several years after a tree is removed due to the juglone released from rotting roots.

References

1. http://www.gov.on.ca/OMAFRA/english/crops/facts/info_walnut_toxicity.htm
2. *Black Walnut Toxicity*, Toronto, Canada: Publication 84-050. Ministry of Agriculture and Food, Queen's Printer for Ontario, Nov.1984.

Produced by the Toronto Master Gardeners, these Gardening Guides provide introductory information on a variety of gardening topics.

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Revised January 8, 2006