

# Black Walnut Toxicity to Plants, Humans and Horses

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The roots of Black Walnut (*Juglans nigra* L.) and Butternut (*Juglans cinerea* L.) produce a substance known as juglone (5-hydroxy-alphanaphthaquinone). Persian (English or Carpathian) walnut trees are sometimes grafted onto black walnut rootstocks. Many plants such as tomato, potato, blackberry, blueberry, azalea, mountain laurel, rhododendron, red pine and apple may be injured or killed within one to two months of growth within the root zone of these trees. The toxic zone from a mature tree occurs on average in a 50 to 60 foot radius from the trunk, but can be up to 80 feet. The area affected extends outward each year as a tree enlarges. Young trees two to eight feet high can have a root diameter twice the height of the top of the tree, with susceptible plants dead within the root zone and dying at the margins.



Not all plants are sensitive to juglone. Many trees, vines, shrubs, groundcovers, annuals and perennials will grow in close proximity to a walnut tree. Certain cultivars of "resistant" species are reported to do poorly. Black walnut has been recommended for pastures on hillsides in the Ohio Valley and Appalachian mountain regions. Trees hold the soil, prevent erosion and provide shade for cattle. The beneficial effect of black walnut on pastures in encouraging the growth of Kentucky bluegrass (*Poa pratensis* L.) and other grasses appears to be valid as long as there is sufficient sunlight and water.

Gardeners should carefully consider the planting site for black walnut, butternut, or persian walnut seedlings grafted to black walnut rootstock, if other garden or landscape plants are to be grown within the root zone of mature trees. Persian walnut seedlings or trees grafted onto Persian walnut rootstocks do not appear to have a toxic effect on other plants.

Horses may be affected by black walnut chips or sawdust when they are used for bedding material. Close association with walnut trees while pollen is being shed (typically in May) also produce allergic symptoms in both horses and humans. The juglone toxin occurs in the leaves, bark and wood of walnut, but these contain lower concentrations than in the roots. Juglone is poorly soluble in water and does not move very far in the soil.

Walnut leaves can be composted because the toxin breaks down when exposed to air, water and bacteria. The toxic effect can be degraded in two to four weeks. In soil, breakdown may take up to two months. Black walnut leaves may be composted separately, and the finished compost tested for toxicity by planting tomato seedlings in it. Sawdust mulch, fresh sawdust or chips from street tree prunings from black walnut are not suggested for plants sensitive to juglone, such as blueberry or other plants that are sensitive to juglone. However, composting of bark for a minimum of six months provides a safe mulch even for plants sensitive to juglone.

## Plants Observed Growing Under or Near Black Walnut\*

### Trees

- Japanese Maples, *Acer palmatum* and its cultivars
- Southern Catalpa, *Catalpa bignonioides*
- Eastern Redbud, *Cercis canadensis*
- Canadian Hemlock, *Tsuga canadensis*

### Vines and Shrubs

- *Clematis* 'Red Cardinal'
- February Daphne, *Daphne mezereum*
- *Euonymus* species
- Weeping Forsythia, *Forsythia suspensa*
- Rose of Sharon, *Hibiscus syriacus*
- Tartarian Honeysuckle, *Lonicera tatarica*, and most other *Lonicera* species
- Virginia Creeper, *Parthenocissus quinquefolia*
- \*\* Pinxterbloom, *Rhododendron periclymenoides*
- \*\*'Gibraltar' and 'Balzac', *Rhododendron* Exbury hybrids
- Multiflora Rose, *Rosa multiflora*
- Black Raspberry, *Rubus occidentalis*
- Arborvitae, *Thuja* species
- \*\* Koreanspice Viburnum, *Viburnum carlesii*, and most other *Viburnum* species

### Annuals

- Pot-marigold, *Calendula officinalis* 'Nonstop'
- *Begonia*, fibrous cultivars
- Morning Glory, *Ipomoea* 'Heavenly Blue'
- Pansy *Viola*
- *Zinnia* species

### Vegetables

- Squashes, Melons, Beans, Carrots, Corn

### Fruit Trees

- Peach, Nectarine, Cherry, Plum
- *Prunus* species Pear-*Pyrus* species

### Herbaceous Perennials

- Bugleweed, *Ajuga reptans*
- Hollyhock, *Alcea rosea*
- American Wood Anemone, *Anemone quinquefolia*
- Jack-in-the-Pulpit, *Arisaema triphyllum*
- European Wild Ginger, *Asarum europaeum*
- *Astilbe* species
- Bellflower, *Campanula latifolia*
- \*\**Chrysanthemum* species (some)
- Glory-of-the-Snow, *Chionodoxa luciliae*
- Spring Beauty, *Claytonia virginica*
- *Crocus* species
- Dutchman's Breeches, *Dicentra cucullaria*
- Leopard's-Bane, *Doronicum* species
- Crested Wood Fern, *Dryopteris cristata*
- Spanish Bluebell, *Endymion hispanicus*
- Winter Aconite, *Eranthis hyemalis*
- Snowdrop, *Galanthus nivalis*
- Sweet Woodruff, *Galium odoratum*
- Herb Robert, *Geranium robertianum*
- Cranesbill, *Geranium sanguineum*
- Grasses (most) Gramineae family
- Jerusalem Artichoke, *Helianthus tuberosus*
- Common Daylily, *Hemerocallis* 'Pluie de Feu'

- Coral Bells, *Heuchera x brizoides*
- Orange Hawkweed, *Hieracium aurantiacum*
- Plantain-lily, *Hosta fortunei* 'Glauca'
- *Hosta lancifolia*
- *Hosta marginata*
- *Hosta undulata* 'Variegata'
- Common Hyacinth, *Hyacinthus Orientalis* 'City of Haarlem'
- Virginia Waterleaf, *Hydrophyllum virginianum*
- Siberian Iris, *Iris sibirica*
- Balm, *Monarda didyma*
- Wild Bergamot, *M. fistulosa*
- Grape Hyacinth, *Muscari botryoides*
- Sweet Cicely, *Myrrhis odorata* 'Yellow Cheerfulness,' 'Geranium,' 'Tete a Tete,' 'Sundial,' and 'February Gold'
- Sundrops, *Oenothera fruticosa*
- Sensitive Fern, *Onoclea sensibilis*
- Cinnamon Fern, *Osmunda cinnamomea*
- Peony, \*\**Paeonia* species (some)
- Summer Phlox, *Phlox paniculata*
- Mayapple, *Podophyllum peltatum*
- Jacob's-Ladder, *Polemonium reptans*
- Great Solomon's-Seal, *Polygonatum commutatum*
- Polyanthus Primrose, *Primula x polyantha*
- Lungwort, *Pulmonaria* species
- Bloodroot, *Sanguinaria canadensis*
- Siberian Squill, *Scilla sibirica*
- Goldmoss Stonecrop, *Sedum acre*
- Showy Sedum, *Sedum spectabile*
- Lamb's-Ear, *Stachys byzantina*
- Spiderwort, *Tradescantia virginiana*
- Nodding Trillium, *Trillium cernuum*
- White Wake-Robin, *Trillium grandiflorum*
- *Tulipa* Darwin 'White Valcano' and 'Cum Laude,' Parrot 'Blue Parrot,' Greigii 'Toronto'
- Big Merrybells, *Uvularia grandiflora*
- Canada Violet, *Viola canadensis*
- Horned Violet, *Viola cornuta*
- Woolly Blue Violet, *Viola sororia*

\*These are based upon observations and not from clinical tests.

\*\*Cultivars of some species may do poorly.

## Plants That Do Not Grow Within 50 Feet of Drip Line of Black Walnut

### Herbaceous Perennials

- Colorado Columbine, *Aquilegia caerulea*
- Wild Columbine, *Aquilegia canadensis*
- Asparagus, *Asparagus officinalis*
- \**Chrysanthemum* *Chrysanthemum* species (some)
- *Baptisia australis*

- *Hydrangea* species
- Lilies, *Lilium* species (particularly the Asian hybrids)
- Alfalfa, *Medicago sativa*
- Buttercup, *Narcissus* 'John Evelyn,' 'Unsurpassable' 'King Alfred' and 'Ice Follies'
- Peonies, \**Paeonia* species (some)
- Rhubarb, *Rheum rhabarbarum*

### Trees

- Silver Maple, *Acer saccharinum*
- European Alder, *Alnus glutinosa*
- White Birches, *Betula* species
- Northern Hackberry, *Celtis occidentalis*
- Apples and Crabapples, *Malus* species
- Norway Spruce, *Picea abies*
- Mugo Pine, *Pinus mugo*
- Red Pine, *Pinus resinosa*
- Eastern White Pine, *Pinus strobus*
- Basswood, *Tilia heterophylla*

### Shrubs

- Red Chokeberry, *Aronia arbutifolia*
- *Hydrangea* species
- Mountain Laurels, *Kalmia* species
- Privet, *Ligustrum* species
- Amur Honeysuckle, *Lonicera maackii*
- Brush Cinquefoil, *Potentilla* species
- Rhododendrons and Azaleas, \*\**Rhododendron* species (most)
- Blackberry, *Rubus allegheniensis*
- Lilacs, *Syringa* species and cultivars
- Yew, *Taxus* species
- Blueberry, *Vaccinium corymbosum*
- \**Viburnum plicatum tomentosum* 'Mariesii'

### Annuals and Vegetables Transplants

- Cabbage, *Brassica oleracea capitata*
- Peppers, *Capsicum* species (some)
- Tomatoes, *Lycopersicon esculentum*
- Flowering Tobacco, *Nicotiana glauca*
- *Petunia* species and cultivars
- Eggplant, *Solanum melongena*
- Potato, *Solanum tuberosum*
- double-flowered cole vegetables

\*Cultivars of some species may survive but will do poorly.

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