



*Juglans* (walnut) trees are large, majestic, and beautifully shaped, the leaves are nicely colored and the nuts are edible. Sounds like a good tree to have, right? Well...maybe there is one issue to consider. The plants within the genus *Juglans* produce a nontoxic chemical called hydrojuglone. This chemical, when exposed to air and/or soil goes through a process of oxidation producing juglone – which is toxic to many other plant materials (this is called an allelopathic response). The plant's reaction to juglone may range from sudden death to a general and prolonged malaise, to no visible response at all. Unfortunately, once wilting becomes part of the decline, it is often too late to save the affected plant material. That sounds rather doom and gloom. But, it is really just another piece in the puzzle when choosing and placing plant material. How serious of a problem is juglone? How long does it last? Are there a lot of plants that will play nicely with the *Juglans*?

Soil, organic material, drainage, age of trees, root depth, cultural practices, and compatibility all play important roles in the toxic severity of juglone. Different *Juglans* plants give off varying amounts of hydrojuglone. Different soils have varying amounts of air space and water within their profile which will affect the level of oxidation - resulting in varying amounts of juglone. Healthy soils with good levels of organic material and good drainage may not have intense juglone issues as the beneficial microorganism activity is greater. And one of the few things that love to metabolize juglone is soil microorganisms. Young plants do not produce noticeable amounts of hydrojuglone until they reach the age of 7 or 8 years. Until that time, roots of susceptible plants would have to be touching *Juglans* roots (suggestively underground) in order for a toxic reaction to occur. Below ground level – roots extend roughly one and half times the height of

the plant. And while most of the toxins result from underground oxidation, leaf and nut debris do exude hydrojuglone which can oxidize and produce juglone above ground. Juglone produced from above-ground debris will generally occur within the drip-line area or 50 to 60 feet beyond. A handful of the most susceptible plants include: *Asparagus officinalis* (asparagus), *Betula papyrifera* (white birch trees), *Brassica oleracea* (cabbage), *Lycopersicon esculentum* (tomato), *Magnolia x soulangiana* (saucer magnolia), *Paeonia* (some peonies), *Solanum melongena* (eggplant), *Pinus strobus* (white pine – just needs a whiff of juglone to fall over dead), *Solanum tuberosum* (potato), *Tilia americana* (linden trees), *Vaccinium* (blueberries – which are tough to grow in our area anyway).

The staying power of juglone is very dependent on the physical and cultural conditions outlined above. But – in general – it can remain at very toxic levels in the soil anywhere from a few months to years. Healthy soil microorganisms are key to the metabolic breakdown and subsequent toxin neutralization. Improving the overall health and increasing the levels of organic matter in the soils surrounding *Juglans* plantings will help to minimize the toxic effects. What exactly are those effects? If a plant is susceptible, the toxins inhibit plant respiration, cause water and nutrient uptake blockages, and interrupt germination.

What plants play nice with *Juglans*? Oh – there are lots of them. Most of the hardy, fall planted bulbs - alliums, crocus, daffodils, hyacinth, and tulips - are not bothered by juglone toxicity. Some fruits and vegetables that seem to do okay are *Allium cepa* (onion), *Asimina triloba* (pawpaw - yes, it can grow here if you buy from a northern seed source), *Beta vulgaris* (beets), most melons, *Pastinaca sativa* (parsnip), *Phaseolus*

(lima and snap beans), *Prunus* (cherries, nectarine, peach, and plum), *Pseudocystopteris* *oblonga* (quince), *Rubus occidentalis* (black raspberry), most squashes, and *Zea mays* (sweet corn). Ornamentals that are known to grow near *Juglans* are: *Acer palmatum* (Japanese maples), *Ajugia pyramidalis* (bugleweed), *Alcea rosea* (hollyhock), *Arissema triphyllum* (jack-in-the-pulpit), *Asarum europaeum* (European wild ginger), *Calendula officinalis* (calendula), *Campanula latifolia* (bellflower), *Catalpa*, *Cercis canadensis* (eastern redbud), *Clematis*, *Crataegus* (hawthorn), *Daphne*, *Euonymus alata* (burning bush), *Forsythia*, *Hemerocallis*, *Galium odoratum* (sweet woodruff), *Geranium sanguineum* (cranesbill geranium), *Heuchera* (coral bells), *Hibiscus syriacus* (rose of sharon), *Hosta*, *Ipomoea* (morning glory, sweet potato vine), *Iris*, *Juniperus virginiana* (eastern red cedar), *Monarda* (bee balm), *Oenothera fruticosa* (evening primrose), *Pachysandra*, *Parthenocissus quinquefolia* (Virginia creeper), *Phlox*, *Podophyllum peltatum* (Mayapple), *Polygonatum commutatum* (great Solomon's seal), *P. odoratum* (Solomon's Seal), *Primula vulgaris* (primrose), *Quercus* (oak), *Sedum*, *Stachys* (lamb's ear), *Syringa* (lilac), *Thuja* (arborvitae), *Tradescantia virginiana* (spiderwort), *Trillium*, *Tsuga canadensis* (Canadian hemlock), *Viburnum*, *Vinca minor* (periwinkle), *Viola* (pansy), and *Zinnia*.

Just another hurdle – and don't try to kid me, we gardener's love a good challenge.