Insects Pests Of Black Walunt

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Black walnut, Juglans nigra L., is an indigenous tree species that grows over a large portion of the United States east of the 100th meridian. It is a component of many of the eastern forest types but is seldom abundant. It occurs as a minor species in a few forest types and is generally found scattered among other trees. Pure stands are rare and usually found on the edge of the forest (Fowells 1965). In its native habitat, black walnut has few important insect enemies. The establishment and management of black walnut plantations, especially in the Midwest, have increased in recent years. Will the plantation landscape change the dynamics of insect herbivore - black walnut interaction? If so, what does this mean for the resource manager or land owner?

According to Marshall (1989), the reference book Insects of Eastern Forests (1985) lists sixty-five species of insects affecting the genus Juglans and black walnut (Marshall 1989). Kearby (1975) collected 62 species of insects associated with black walnut plantations in Missouri, and Nixon and McPherson (1977) listed approximately 300 species from plantations in southern Illinois. Many species of insects are associated with black walnut; however, few are pests of importance.

Marshall (1989) discussed the importance of insects affecting the growth and quality of black walnut trees. He presented information on numerous species of insects but suggested that relatively few should be of concern to black walnut growers. Among those that cause concern are the following: walnut shoot moth (Acrobasis demotella Grote), ambrosia beetle (Xylosandrus germanus (Blandford)) and periodical cicada (Magicicada spp.) because of their impact on wood quality; the walnut shoot moth, walnut caterpillar (Datana integerrima Grote & Robinson), fall webworm (Hyphantria cunea (Drury)), oystershell scale (Lepidosaphes ulmi (L.)) and ambrosia beetle because of their impact on tree growth. The black walnut curculio, Conotrachelus retentus (Say), an insect which impacts nut production in black walnut plantations (Linit and Necibi 1995) should be added to this list.

The propagation of black walnut outside the forest, its evolutionary home, changes the dynamics of insect-plant interactions. Establishment of a black walnut plantation results in a concentration of plant resources and increased plant apparency. In addition, plantation management practices may affect the survivorship of insect herbivores and their natural enemies, especially those which overwinter in the soil. How insect herbivores react to this new landscape will depend upon the interaction of the insect life history and management decisions made by the land owner. Below, four types of insect herbivores that feed on black walnut; a nut feeder, a defoliator, a shoot borer, and a sucking insect are examined. Aspects of their biology and plantation management decisions which may influence their success in a plantation environment are discussed. Control recommendations for several insect pests of black walnut are presented in a Purdue University Cooperative Extension Publication appended to this article.

The **black walnut curculio** develops in the nuts of black walnut and butternut. Nuts are produced in abundance on an irregular basis. The female curculio deposits an egg within a developing nut. The larva hatches then feeds within the nut causing it to drop prematurely (Blair and Kearby 1979). The pupal stage and the overwintering adult stage occur within the litter layer or soil. The abundance of the curculio is determined by the availability of nuts during the previous year (Linit and Necibi 1995). This relationship can be expected to hold as new walnut varieties are developed to increase the nut bearing capacity of the tree. Growers are not likely to experience outbreaks of the curculio but as nuts become more abundant in black walnut plantations the abundance of the curculio is likely to increase. Mowing or harvesting of ground vegetation within the plantation may be disruptive to the curculio life cycle and may prove to be a valuable pest management tactic (Linit and Necibi 1995).

The **walnut caterpillar** is the most destructive leaf feeding insect that occurs on black walnut. The female deposits a mass of eggs on the underside of leaves, often along forest margins or in forest openings, or on open grown trees such as ornamentals or trees in plantings (Farris and Appleby 1979). The larvae feed on leaves of several species in the Juglandaceae including walnut, butternut, pecan, and various species of hickory. If leaves within a tree become scarce the larvae will scatter in all directions in search of a new host. In a diverse plant habitat numerous non-host plants exist and larvae may have difficulty locating a suitable host. Larvae searching for additional foliage in a black walnut plantation need only find the next tree. The walnut caterpillar has many characteristics of an eruptive species, thus, occasional outbreaks should be expected. Walnut caterpillars pupate in the soil during late summer. Therefore, manipulation of ground vegetation may provide opportunities for management of this defoliator.

The **walnut shoot moth** is the most destructive shoot borer on black walnut. Females deposit single eggs on the undersides of walnut, hickory or pecan leaves in early summer. The young larva feeds on the lower epidermis of the leaves on which they hatch. In late summer, the larva constructs a hibernacula, located at the base of terminal bud or lateral buds, in which to overwinter. The larva emerges from the hibernacula at bud swell and feeds on the expanding bud. The larva bores into the elongating shoot and tunnels through the pith, destroying the shoot. The mature larva leaves the shoot and pupates in the soil (Kearby 1979, Martinat and Wilson 1979). Kearby (1979) suggested that total shoot loss in a black walnut plantation due to the shoot moth may be only 1 to 5 percent a year. While the annual incidence may remain low, deformity due to a shoot dieback may permanently reduce the value of the tree.

Like the walnut shoot moth, the **ambrosia beetle** can affect the growth and form of young black walnut trees and can also affect log quality. The beetle creates galleries within the wood of infested trees. During gallery construction, the beetle introduces a fungus that will stain the wood. Ambrosia beetle attacks on seedling or sapling age trees can result in form damage. If the terminal leader dies back, a new terminal shoot develops causing a sweep or crook in the future log. If killed back to the root collar, these young trees may produce multiple sprouts. Weber and McPherson (1984) found that the ambrosia beetle preferentially attacks slow growing seedlings and saplings and may not attack larger trees. They also reported that the impact of attack on young trees may be minimal because the trees have time to recover and produce quality logs prior to harvest age. Chemical control of the ambrosia beetle is not practical because the insect spends most of its life within the tree protected from chemical sprays. Weber (1982) recommended the use of cultural practices, such as the selection of appropriate planting sites and weed control, to maintain vigorous growth of black walnut seedlings and saplings as a deterrent to ambrosia beetle attack.

Piercing-sucking insects, such as scale insects and aphids, insert their mouthparts into the vascular tissue of twigs and feed on the vascular fluids. The oystershell scale is one such insect. Eggs are deposited and overwinter under the adult female scale. First instar larvae, called crawlers, disperse to new host trees and attach themselves to a twig on a suitable host. The scale has a wide host range including many fruit and hardwood trees grown in forests or as ornamentals. Heavy infestation can result in branch dieback. Many piercing-sucking insects have characteristics of eruptive species and occasional outbreaks should be expected.

The life history characteristics of an insect herbivore determine its ability to rapidly increase in abundance and thus its capacity to attain outbreak densities. The spatial and temporal occurrence of outbreaks is greatly influenced by biotic and abiotic factors such as parasitoids and predators, climatic conditions and resource availability (quantity) and quality. The establishment of black walnut plantations will influence a host tree - insect interactions. The implications for management of insects feeding on black walnut are not always obvious. Understanding the impact of resource concentration, through plantation establishment, on insect herbivores, and the biological interactions between insect life histories and plantation management practices should facilitate pest management decisions in a plantation landscape.

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