

INTEGRATED PEST MANAGEMENT OF THE SOUTHERN PINE BEETLE IN THE URBAN SETTING

by D.L. Ham and G.D. Hertel

Abstract. Sometimes in the South, southern pine beetles move from forests into urban areas. Therefore, arboriculturists should learn how to recognize and cope with beetle attacks. Information is provided on the beetle's life cycle, habits, and symptoms of attack, and what makes a tree susceptible to attack. The best direct control and prevention practices can then be recommended and used.

Outbreaks of the southern pine beetle (SPB), *Dendroctonus frontalis* takes place at periodic intervals throughout much of the South. Widespread losses can occur in both forest and urban areas. In the early 1970s, the SPB killed enough pines to build about 55,000 new homes. Sometimes the beetles move from the forest into urban situations. Because of this, arboriculturists should learn how to recognize and cope with an SPB attack. Integrated pest management (IPM) approaches to this problem utilize a number of cultural and chemical treatments. A good knowledge of the beetle's life cycle, habits, and symptoms of attack, and what makes a tree susceptible to attack is important in recommending effective control practices.

Description and life cycle. Each SPB attack involves one pair of adult beetles. The adults are shortlegged, stout, and about 1/8 inch long. Mature beetles are dark reddish brown to black. When populations build up, thousands of beetles may invade individual trees. In fact, these mass attacks may be necessary to overwhelm the natural defenses of the trees. Each pair constructs a winding or S-shaped gallery (Fig. 1) in the inner bark, and the female deposits pearly-white eggs in individual niches cut into each side of the gallery.

The eggs hatch into whitish, crescent-shaped larvae with glossy, reddish-brown heads. Newly hatched larvae mine for a short distance in the soft inner bark; older larvae mine out into the corky bark. When fully grown, larvae are about 1/8 inch

long and change to the resting stage, or pupae, which are pure white, very soft, and resemble the adult beetle.

When pupation is complete, the newly formed adults are soft bodied and amber colored. They quickly harden, darken, and chew exit holes through the bark and take flight. Emerging beetles may invade unattacked trees in the vicinity or fly considerable distances before attacking another tree.

Adults from overwintering broods emerge and begin to attack uninfested trees in early spring, about the time dogwood trees flower. During outbreaks, beetle activity peaks in early summer in the Gulf States and in late summer and early fall farther north. Depending upon latitude, there may be three to seven beetle generations each year. Often all life stages (adults, eggs, larvae, pupae) are present in different trees in the same locality. Under ideal conditions, the number of beetles may increase ten-fold in a single generation and sparse populations may increase to epidemic numbers within a single season (Thatcher et al. 1978).

How beetles kill pines. Southern pine beetles can kill a pine tree in a few days. Thousands of winged adults attack a single tree, bore through the bark, and construct egg galleries. The females lay eggs, and in a week or so, larvae hatch and start chewing their way through the living phloem or inner bark. This feeding girdles the pine. A blue-stain fungus, carried into the inner bark, hastens tree death by plugging water-conducting tissues. Although trees may be dead, crowns may remain green for some time, even after beetle broods have vacated the trees.

Associated beetles. Southern pine beetles attack a tree by themselves or may be accompanied by one to three species of *Ips* engraver beetles and/or the black turpentine beetle. The different species sometimes strike at the same time, making it hard to tell which was responsible



Figure 1. Winding or S-shaped galleries cut under the bark by southern pine beetle adults.

for killing the pine.

The three species of *Ips* engravers are commonly distinguished on the basis of relative size and point of attack on the tree. The smallest is slightly smaller than the SPB, and attacks the upper part of the pine, including the top and live branches. Middle-sized *Ips* prefer the midsection and upper level of the trunk, while the large engravers seem to favor the lower third. All species of *Ips* usually kill only one or a few pines in isolated infestations and need no help from other bark beetles.

The black turpentine beetle is the largest bark beetle in the South. It resembles the SPB, but is about 3/8 inch long. It is the least destructive because it attacks smaller numbers and does not carry the blue-stain fungus. The black turpentine beetle attacks the lower 3-6 feet of weakened or

damaged pines and readily invades freshly-cut stumps.

Successful attacks by SPB or by any species of *Ips* engravers almost always kill at least part of the tree. But quick action can save pines attacked by black turpentine beetles. Because control measures depend in part on whether or not the tree can be saved, the species of beetle(s) involved in the attack must first be identified.

Symptoms of beetle attack. First signs of SPB attacks are popcorn-size lumps of clear or whitish pitches, called "pitch tubes," which occur in bark crevices at heights up to 60 feet (Fig. 2). Pitch tubes left by *Ips* beetles are reddish due to bark dust being mixed with the pitch. The black turpentine beetle-caused pitch tubes are also reddish-brown but have a diameter about the size of a 50-cent piece. During dry weather when pitch flow is slow, pitch tubes may not develop; instead, red boring dust, which looks like fine red sawdust, collects in bark crevices and on spiderwebs and the foliage of understory plants at the base of the tree.

In later stages of SPB attack, if pieces of bark are removed, you will see S-shaped galleries on the inside of the bark. *Ips* cut either "Y"-, "I"-, or "H"-shaped tunnels in the inner bark. The black turpentine beetle larvae feed as a group and make a cave-like gallery. The larvae can consume as



Figure 2. Pitch tube, the tree's response to southern pine beetle attack.

much as 1 to 2 square feet of inner bark (Merkel 1981). The final sign of attack — and a sure mark of death for the tree — is the fading of the foliage from green to yellow to red to brown. A detailed description of beetle biology and attack symptoms can be obtained in Berisford et al. (1983).

Pines likely to be attacked. Some pine species are apparently more susceptible to SPB attack than others. During a beetle population explosion, however, the insects will overcome any pine that is available.

Old, unhealthy, or otherwise weakened pines of all species are often attacked by pine beetles. Healthy pines can sometimes “pitch out” beetle attacks by entrapping or smothering the invaders with a heavy, prolonged flow of pitch. What weakens pines? Natural causes like old age, overly dense stand conditions, drought, prolonged floods, hard freezes, and lightning strikes commonly reduce the vigor of a pine and make it more susceptible to attack.

Man, too, causes problems. Common landscaping practices, like bulldozing and grading around foundations, streets, and sidewalks, may inadvertently pave the way for beetles by damaging tree roots and trunks. Heavy traffic by trucks and other construction equipment often packs the soil or breaks tree roots. Soil levels are often changed and the normal movement of water and air to the roots is disrupted. The above-ground portion of the trees may also be damaged or scarred. A slide tape entitled “Building Among the Pines” covers these problems, and is available from Southern Forestry Extension and State Forestry Commission offices in the Southern States.

What you can do. Since damaged or weakened pines are more susceptible to bark beetle attack, the best preventive approach is to keep them healthy and growing vigorously. This may be accomplished by protecting trees from construction or site damage that weakens them and makes them susceptible to insect attack. Fertilizing and mulching will improve growth and conserve soil moisture.

Pines growing too close together compete with each other for water and nutrients. The selective removal of some of them will improve the growth and vigor of the remaining ones. If several types of pine can be satisfactorily grown in an area, the

more SPB-resistant species should be favored — loblolly, Virginia, and eastern white pine in the Piedmont and southern Appalachian mountains, and longleaf and slash pines in the coastal plain.

When SPB populations are high in an area, the beetles become so numerous that they can overcome even healthy pines. Under these conditions, cultural treatments alone may not provide the desired degree of protection against attack. Two insecticides, lindane and chlorpyrifos (Dursban®), are currently registered and may be used to protect trees against SPB attack in high value or special use areas.

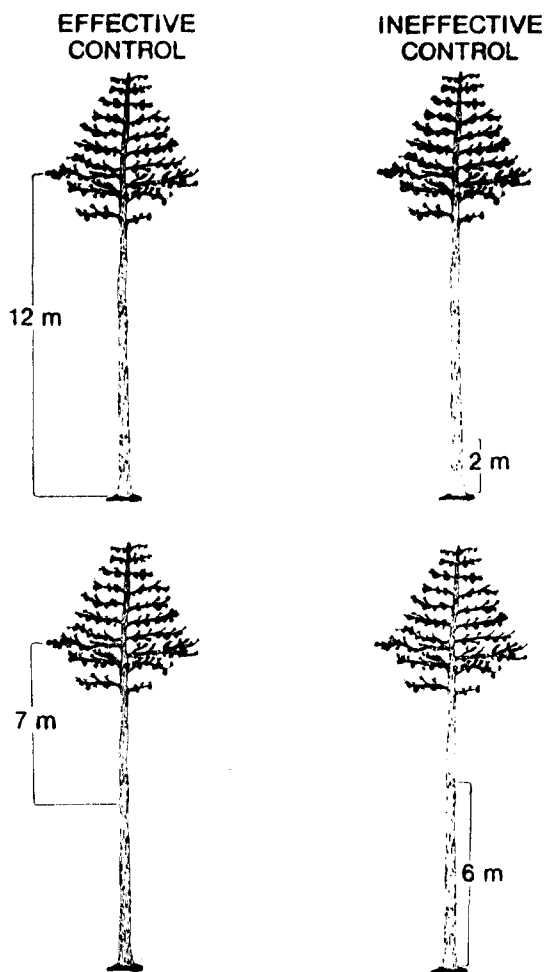


Figure 3. Treatments which result in either effective or ineffective preventive control of the southern pine beetle (provided by Dr. Wayne Berisford, Univ. of Georgia).

The length of time that the insecticides will prevent SPB attacks depends on several factors, including weather conditions, SPB population levels, and application according to label directions. Studies have shown that lindane provides excellent protection for up to 15 months (Brady et al. 1980). Therefore, one lindane application in the spring will provide good protection during the season when the beetles are most active. In addition, it gives some protection during the colder months when SPB activity is low. Two sprays a year would be needed for maximum protection. Chlorpyrifos is as effective as lindane for up to 4 months. One should also remember that it is important to spray the correct portions of the tree bole (Fig. 3) — the entire bole from the base up to the live crown, or the upper half of the bole from mid-bole to the base of the live crown (Berisford et al. 1982).

But what if beetles have attacked the trees and are still under the bark? In this case, cutting the infested trees is a must. All of the infested material must be removed, burned, or thoroughly sprayed with one of the three insecticides discussed earlier before the beetles emerge from the logs. In warm weather, the time interval from tree attack until brood adults emerge can be as short as 1 month. Therefore, good detection and fast action are necessary for control to be effective.

Pest management specialists in the Cooperative

Extension Service and Federal and State forestry agencies have publications and information that are very helpful in effectively dealing with the southern pine beetle and its associates.

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ABSTRACT

HARIVANDI, A. 1983. **Pondering pH and pesticides.** Golf Course Management 51(8): 68-69.

There is general scientific agreement that soil pH (or pH of any medium, for that matter) does influence pesticide activity. It may directly or indirectly influence the detoxification of pesticides by affecting the ionic or molecular character of the chemical itself, or the ionic character of soil colloids, or by altering the soil's cation exchange capacity, or even by affecting the inherent capacity of the microbial population to respond to a given chemical. Many pesticide labels and compatibility charts state that certain pesticides should not be combined with alkaline materials such as lime, or even with water in the alkaline range. This is extremely important, since ignoring this direction can cause the pesticide's active ingredient to break down in the tank, thereby becoming totally ineffective.