Hollow Stakes for Detecting Subterranean Termites (Isoptera: Rhinotermitidae)[1]

by

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ABSTRACT

Wooden stakes are commonly used to detect subterranean termites. We describe a modification of this method using a hollow stake capped with a cork stopper. *Coptotermes formosanus* workers rapidly colonize these stakes and feed on the cork. Since the stakes need not be pulled from the ground for inspection, termite foraging galleries are not disturbed and collection traps can be installed directly over the orifice in the stake.

INTRODUCTION

Subterranean termites (Isoptera: Rhinotermitidae) are, by their cryptic nature, difficult to study. A number of different methods have been developed to detect, aggregate, and collect soil-dwelling termites. Destructive sampling by collecting and removing foraging groups from fallen wood and logs (La Fage *et al.* 1983) or infested structural timbers (Grace 1986), or by excavating termite gallery systems (King & Spink 1969; Abe & Matsumoto 1979; Howard *et al.* 1982) is not practical at many locations and precludes any further use of the disturbed site. Thus, trapping techniques are preferable for regular collection of large numbers of foraging termites, monitoring colony demographics, or studying termite feeding on different substrates (La Fage *et al.* 1973; Tamashiro *et al.* 1973; Esenther 1980; French & Robinson 1980; French & Robinson 1981; Su & Scheffrahn 1986; Ewart 1988; Grace 1989; Pearce 1990).

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Wooden stakes are commonly used as the initial means of detecting subterranean termites at field sites. However, depending upon local climate and soil conditions, termite colony size, and the foraging behavior of the particular species, this method is generally not very rapid and is fairly labor-intensive, since the stakes must be pulled by hand for inspection, then driven back into the ground. Moreover, pulling the stakes disrupts foraging galleries in the soil, which can greatly delay termite re-infestation of collection traps. We describe here a simple modification of the stakes that can increase the rate of termite colonization, decrease the time and labor required for stake inspection, and prevent disruption of the foraging galleries.

MATERIALS AND METHODS

In Hawaii, rectangular hollow wooden traps are used for monitoring and collection from colonies of *Coptotermes formosanus* Shiraki (Tamashiro *et al.* 1973). This trapping technique was modified for use in urban Florida by Su & Scheffrahn (1986). For field tests of a gravel barrier to termite penetration (the Basaltic Termite Barrier, or BTB), this trap was reduced to a narrow, below-ground structure: a hollow stake (Tamashiro *et al.* 1991). This 2 X 2 X 8-inch (ca 4 X 4 X 20-cm) Douglas-fir stake with a 1.2cm hole drilled completely through the long dimension was placed in the center of the test substrate, and the hole capped with a cork stopper. Termite penetration of the substrate was determined without disturbing the stake by simply removing the cork (Tamashiro *et al.* 1991).

As a detection tool for *C. formosanus*, we now use 20-cm long Douglas-fir stakes cut from either 1 X 2-inch or 2 X 2-inch (ca 1.5 X 4-cm or 4 X 4-cm) lumber. Either a 0.75 or 1cm diameter hole is drilled through the longitudinal dimension, stopping ca 2-3cm from the point, since the stake is much easier to drive with a solid point. Cork is an effective bait substrate for *Coptotermes* spp. (French *et al.* 1986). Termites tunneling into the stake rapidly reach the central void and explore vertically, attacking the cork stopper. As a result, inspection of the cork for signs of feeding damage is generally all that is required, rather than actually removing the cork to inspect the void. As the cork is

fed upon, *C. formosanus* seals the hole with visible carton material. Thus modified, the traditional wooden stake becomes an efficient detection device.

RESULTS AND DISCUSSION

At least one pest control company in Hawaii currently uses wooden stakes to detect subterranean termites around buildings under contract and determine the need for re-treatment of the immediate soil area (R. Mateo, Terminix International, pers. commun.). Another pest control operator has told us that his father placed similar stakes at the corners of homes in New Jersey for *Reticulitermes* spp. detection over 20 years ago (M. Krupnick, Certified Pest Control, pers. commun.). The reduction in the time needed to inspect drilled stakes should increase the popularity of this monitoring method as an adjunct to periodic interior inspections of termite-threatened buildings.

Other researchers have now successfully used this stake design to detect subterranean termites at field plots (B.M. Kard, USDA Forest Service, pers. commun.). In addition, having aggregated termites at the stake and cork stopper, it is a simple matter to extend the feeding site with minimal disruption. A narrow coil of corrugated cardboard is inserted into the drill-hole and left protruding above the stake (Fig. 1). Termites readily accept this material as a gallery extension (La Fage *et al.* 1983; French & Robinson 1985) and will travel along it into a series of polyvinylchloride (PVC) pipe traps. Thus, hollow stakes enable manipulation of *C. formosanus* in the same manner as the congeneric mound-building species *C. lacteus* (Froggatt) and *C. acinaciformis* (Froggatt) (French & Robinson 1985; Ewart 1988).

Beyond monitoring for detection purposes, hollow stakes may play a larger role in the future of termite IPM (Ewart *et al.* 1991). Placement of hollow stakes is the logical first step in locating toxic baits for subterranean termite control. Since the stake need not be disturbed to add a toxicant-delivery chamber over the drill-hole, it serves a pre-baiting as well as detection function. In fact, the hollow center of the stake might itself serve as a reservoir for the introduction of toxins or pathogens to the termites' gallery system.

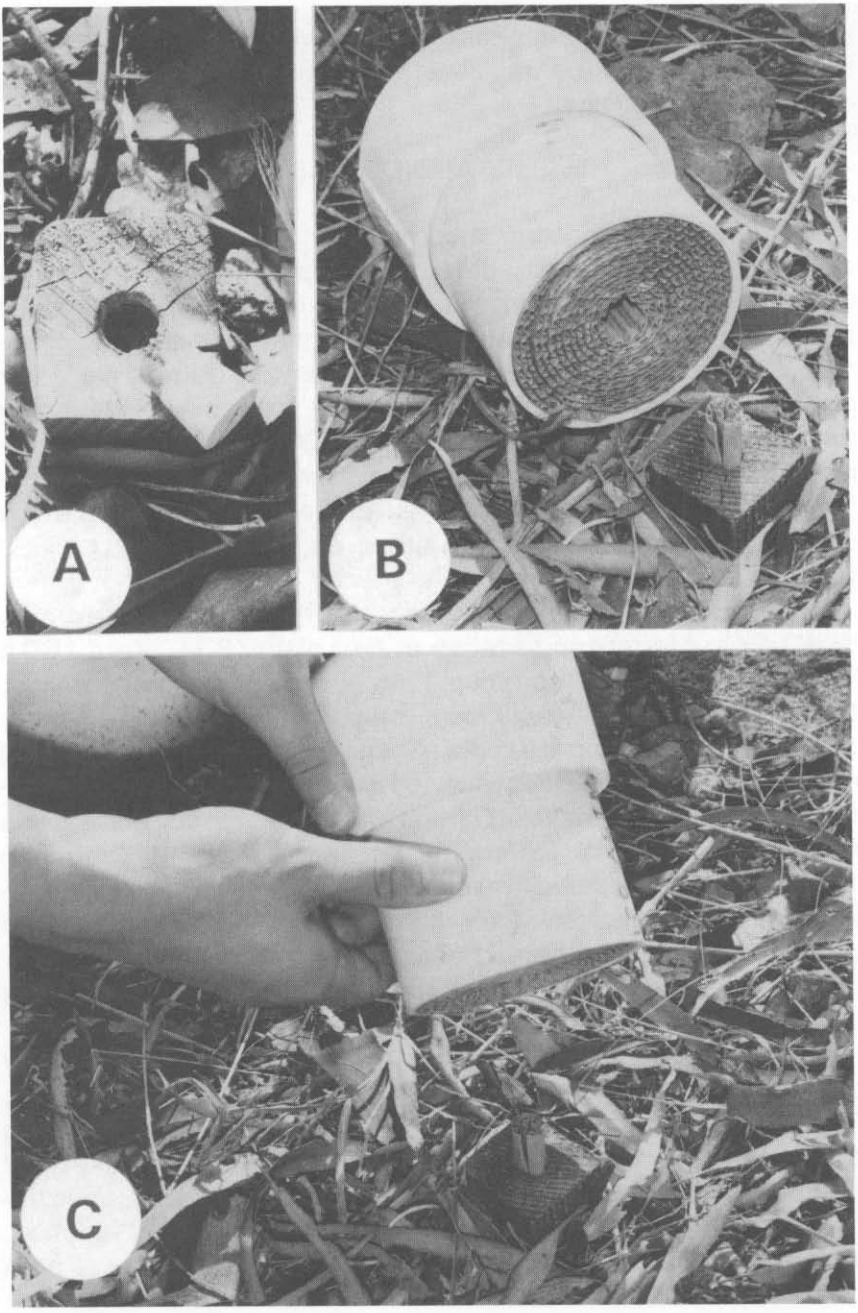

Fig. 1. Use of hollow stake to monitor *C. formosanus*: A, top of infested stake with damaged cork; B, PVC termite collection trap and stake with coil of corrugated cardboard in drill hole; C, collection trap placed over infested stake.

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