Kimberly Engler
Program Specialist-Urban IPM
k-engler@tamu.edu

Subterranean Termites

Termites are classified in the Order Isoptera, meaning "equal winged." Termites feed on any cellulose material, such as live and dead tree branches, roots, plant litter, paper, cardboard, and fiberboard. Since termites break down cellulose into usable nutrients, they are important in our ecosystem. However, they become economic pests when they invade human dwellings and structures. Over 2 billion dollars is spent annually in the in the U.S. on the control and repair of termite damage, where subterranean termites are responsible for 80% of this damage.

Distribution

Subterranean termites are found in every state in the United States, except Alaska. There are two subterranean termite genera that cause most of the structural damage in Texas. *Reticulitermes* is one genus that contains several species that cause structural damage. The other genus is *Coptotermes,* where one main species causes most of the structural damage, the Formosan termite, *Coptotermes formosanus* Shiraki.

Caste System

Termites are social insects, with a caste system comparable to ants and bees. Each caste member within a termite colony has distinct physical and behavioral characteristics. For instance, the primary reproductives are sexually mature males and females that form new colonies through swarming flights.

If one primary reproductive is injured or dies, then secondary or tertiary reproductives are produced. The secondary and tertiary reproductives are cream colored and they have developing wing buds. They will mate and lay eggs, but they will never swarm. They also play a role in the growth of the colony, by forming independent satellite colonies when the parent colony grows large.

Workers are the most abundant caste found in the termite colony. They are blind, wingless and can be either male or female. The workers are involved in most of the laborious activities, such as constructing and repairing tunnels. Their mouthparts are hardened and are adapted to chewing through hard materials. They also care for the eggs and young; forage for food; feed fellow nestmates; groom soldiers, reproductives, and fellow workers; and assist the soldiers in defending the colony.

The main function of the soldier caste is to defend the colony. The soldiers are blind, wingless, and can be either male or female. The soldier has a large head with two large mandibles that are designed to puncture and crush enemies. Their jaws are incapable of chewing through wood, so they have to be fed a liquid diet. The soldiers congregate around open areas and open their jaws outward. The soldiers will beat their head against the gallery walls to signal to others that enemies are around. Sometimes inspectors can detect this tapping by listening carefully.

Examples from each caste of *Reticulitermes spp.:*

Winged Reproductives

Workers

Soldier

Colony Formation: Swarming

When swarming, the winged reproductive termites emerge from the colony at suitable times, depending on the species and environmental conditions. The Formosan termite reproductives swarm at dusk from April to July, with larger swarms in May and June. The *Reticulitermes spp.* swarm during the day from February to May. However in heated buildings, swarms may occur in mid-winter.

Cellulose Preference and Digestion

Even though termites will feed on almost any cellulose product, they do have preferences. Subterranean termites tend to prefer fungus-decayed wood and moistened wood compared to dry wood. They also like to feed on softer, spring wood.

Colony Construction

Subterranean termites live in colonies underground, in order to avoid sunshine and outside air. They are soft-bodied insects with a thin exoskeleton, so they need to be protected from the outside environment. The workers build the shelter tubes from tiny pieces of soil, wood, and debris that are glued together using secretions and fecal material. Termites tend to have an extensive tunneling system underground that allows them to carry food resources back into the colony. These shelter tubes also protect termites from predators.

The Formosan termite colonies are composed of carton, which is partially digested wood fragments cemented together with salivary secretions and feces. The carton has foraging galleries with porous walls that store water. This allows Formosan termite colonies to be found underground or aboveground such as in wall voids, attics, roof eaves, and hollow trees. Living trees can also serve as a suitable habitat, with carton nests most commonly occurring at the base of the tree.

Inspection

Termite damage may be detected by the presence of mud tubes, damaged wood, and winged termites. Also, termite damage may be apparent on door frames or window sills, or dead termites might be visible along window sills or baseboards. As the subterranean termites feed, they eat the softer wood. This leaves a channeled out or honeycomb appearance to the wood. They feed really slowly, so damage may not be detected for several years.

Preventative Practices: Eliminate Conducive Conditions

Eliminate Wood To Ground Contact: It is very important to eliminate any contact between the wooden parts of the house foundation and to maintain at least 6 inches between the soil and porch steps, lattice work, door or window frames.

Remove Wood Debris: All cellulose materials on or beneath the soil can attract termites and provide a source of food. Stumps, scrap wood, grade stakes, foam boards, cardboard boxes, and newspapers found around structures should be removed. Also before and during construction, never bury wood scraps or lumber in the backfill. Finally, firewood, landscape timbers, compost piles should never be stored against foundations, since these are potential food sources for termites.

Eliminate Moist Conditions: In order to minimize moist areas, grade the soil around the building. This allows the water to drain away from the structure. Water can also be taken away from areas by gutters, down spouts, and splash blocks.

Dense Vegetation: Shrubs, vines, tall grasses and other dense vegetation should not be allowed to grow against structures. Thick vegetation makes it hard for inspectors to look for termite activity, and these plants tend to trap moisture, which provides a favorable habitat for termites.

Excessive Mulch: Termites commonly forage in mulched beds, due to the high moisture levels. Use mulch sparingly and do not allow the mulch to contact wood siding or framing of the doors/windows around the structure, in order to decrease potential termite harborages.

Non-Chemical Approaches To Termite Control:

Termite Shields: Termite shields are installed around potential entry points, such as pipes, foundations, piers, and similar areas. These shields force the termites to build their mud tubes on the outside of the metal.

Physical barriers: Physical barriers can be used to provide protection of the structure from subterranean termites. Some of these barriers include sand and basaltic rock, which prohibit termites from crawling or moving these particles. Another barrier is stainless steel wire mesh which is installed around pipes, posts, or foundations. An example is Termi-Mesh® that is installed beneath concrete slabs and it can be fitted around pipes and wires. One of the newer physical barriers contains a liquid termiticide locked in between two layers of heavy plastic that is installed before the concrete slab is poured, such as Impasse® Termite System (lambda-cyhalothrin).

Using Pretreated Wood: Use wood that has been pretreated with liquid termiticides. The termites must ingest the treated wood, by grooming each other or by exchanging nutrients, in order to cause lethality in the population. Borates are one option for treating wood.

Chemical Control for Termite Control:

Liquid Termiticides: Application of a soil termiticide has been the main method for control of subterranean termites for over 50 years. The termiticide is applied as a continuous chemical barrier around the structure. Termiticide must also be placed under slabs, by drilling and injecting vertically through the slab, or treating horizontally through the foundation from the exterior. The termites attempting to tunnel into the treated area will either be killed or repelled, thus preventing them from entering the structure.

The repellant termiticide causes foraging termites to turn away from the treated areas. These termites are not killed directly, instead they are turned away. This allows termites to be able to tunnel into the structure, if they find gaps within the treated area. The repellant termiticides are the least expensive option, but many gallons of termiticide are used when

treating. Repellants provide immediate protection for the structure, and maintain protection for around 5 years. Currently available repellant termiticides include deltamethrin (Suspend® SC), permethrin (Dragnet® FT, Prelude®), cypermethrin (Prevail® FT, Demon® TC), bifenthrin (Biflex® FT, Talstar® One), and fevalerate (Tribute®).

The non-repellants will kill the termites, since they can not detect the termiticide and continue to tunnel through the treated area. These products contain active ingredients found in newer chemical classes, such as imidacloprid (Premise®), fipronil (Termidor®), and chlorfenapyr (Phantom®). Premise® was the first product on the market, followed by Termidor® and Phantom®. The non-repellant termiticides provide approximately five years or more of control, and provide immediate protection for the structure. However, they are more expensive.

Use of Foam Termiticides: A way to avoid the limitations of liquid treatments is to use foam. Foam is a tool that can be used in areas where liquid applications have given inconsistent results, such as cracks beneath walls, interior expansion joints, or dirt filled porches. Foam can also disperse into more areas and into deeper areas than liquid termiticide. Foam is not a cure all method, but it can be a solution of those hard-to-reach areas. An example of termiticide foam is Premise® containing imidacloprid as the active ingredient.

Use of Termite Bait Systems. The active ingredients found within baiting systems on the market fall into three categories. The first category is insect growth regulators (IGRs), such as are hexaflumuron, diflubenzuron, and noviflumuron. The second category is slow-acting metabolic inhibitors and neurotoxicants, such as hydramethylnon, sulfluramid, and fipronil. The final category is microbial pathogens, such as fungi and bacteria.

The active ingredient in the bait systems are found within the cellulose matrix, on which the termites feed. The matrix formulation must also be palatable to the termites when compared to such items as tree roots, stumps, and wood piles. The worker termites feed on the cellulose matrix and then exchange this material with other members of the colony. This eventually results in the suppression or elimination of the colony. Therefore the active ingredient must be slow-acting and non-repellant chemical, in order to increase the possibility that the actively feeding termite will be able to pass along the chemical to its fellow nestmates.

Either monthly or biannually inspection of the stations occurs to determine termite activity. Once termite activity is observed, then the untreated wood is replaced with a plastic tube containing the toxicant. Additional bait stations should be installed where termites are actively feeding. The inspection process continues until no more activity is detected. After there is no more activity within the bait tube, then the untreated wood is once again placed back into the station. Monitoring areas that formerly had termite activity is required, since there is no long lasting protection after the stations are removed.

Examples of baiting systems include: Sentricon®, First Line® and FirstLine® GT, Exterra®, Outpost®, and Subterfuge®. Sentricon® systems are the most widely used baiting system on the market. In 1996, FirstLine® received registration in the U.S. for above ground areas and FirstLine® GT for below ground. The Exterra® stations are larger than other commercial bait products, so the inspection interval can be up to 90 days. The longer interval between inspections makes the Exterra® system less expensive to maintain than the Sentricon® system. Outpost® and Subterfuge® were introduced in 2002.

There are both advantages and disadvantages when using baiting systems to control subterranean termites. Baits are an environmentally friendly method for termite control, posing less toxic effects to humans and pets. Baiting systems are also advantageous to use in areas that are inaccessible such as in crawl spaces, cracked foundations, or in large commercial structures. Another advantage is the elimination of floor damage, since all bait stations are placed outside. However, this method of treatment costs twice as much with a continued ongoing cost until

control is obtained. Also many stations may be installed around the home, causing an unsightly appearance to some homeowners.

Mention of commercial products is for educational purposes only and does not represent endorsement by Texas Cooperative Extension or The Texas A&M University System. Insecticide label registrations are subject to change, and changes may have occurred since this publication was printed. The pesticide user is always responsible for applying products in accordance with label directions. Always read and carefully follow the instructions on the container label.