

Subterranean Termite Treatment Options

Dini M. Miller, Associate Professor and Extension Specialist, Entomology, Virginia Tech

Introduction

Subterranean termite treatment has changed dramatically over the last two decades. The number of systems, application techniques and products available for termite control has tripled in the last 10 years. Today, if you experience a subterranean termite swarm, you may call four different pest management companies and receive four completely different treatment recommendations. In most cases the Pest Management Professional (PMP) is only familiar with the treatment used by his or her company. So how can you make an informed decision? This fact sheet gives an overview of all the currently available subterranean termite treatment methods. It includes general descriptions of treatment products, brand names, application techniques, and their unique features. Note: Borate applications for pre-construction termite treatments are covered in a separate publication.

Prevention

Subterranean termites feed exclusively on wood materials and have strict moisture requirements. With these characteristics in mind, a lot can be done to prevent an infestation by eliminating the food and moisture resources in their environment. Listed below are a few practical ways to prevent termite infestation by modifying their habitat.



Subterranean termite workers.

- Repair structural and plumbing leaks.
- Pull all mulch and landscaping back at least 6 inches from the foundation.
- Remove piles of trash and debris from around the home.
- Remove dead tree stumps from the yard.
- Keep firewood stacked away from the structure.
- Make sure downspouts are long enough to direct water away from the foundation.
- Keep gutters clean.
- Avoid direct wood-to-ground contact when building porches or decks.
- Siding, brick veneer, or foam insulation should not extend below the soil grade.

Subterranean Termite Treatment

Subterranean termites are widespread throughout the United States. Because they are so abundant, prevention alone may not always protect a structure from infestation. If a structure has become infested, additional action must be taken. Over the past few years, the number of subterranean termite treatment methods has increased dramatically. Below is a description of the most commonly sold methods of termite treatment in Virginia.

Liquid Termiticide Applications

Liquid termiticides are usually applied completely around and underneath a structure covering all areas where termites might gain access. For new construction, this is accomplished by treating the graded soil and

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PMP drilling the steps so that he can inject liquid termiticide against the foundation wall.

foundation walls before the slab is poured. For an existing building, the perimeter of the foundation is trenched and drilled, then treated with termiticide. The goal of the treatment is to put a chemical blanket between the termites in the soil and the structure above. The chemical blanket can also affect those termites inside a building by preventing their successful return to the soil. In many cases, these termites will die of dehydration.

Repellent Termiticides

There are several repellent termiticides on the market. These termiticides are all pyrethroids. Pyrethroids are fast acting nerve poisons that are highly toxic to termites but have low toxicity to mammals. Some of the pyrethroid termite products include Dragnet FT, Cynoff, and Talstar (FMC Corporation, Philadelphia, Pa.) and Demon and Prelude (Syngenta, Inc., Greensboro, N.C.). The pyrethroids are also highly repellent to termites. In most cases, they are so repellent that termites foraging under the soil will avoid coming into contact with the termiticide and forage elsewhere.

There are advantages and disadvantages to repellent termiticides. One advantage is that a complete barrier of repellent termiticide will effectively keep termites from coming into the structure. Also, the pyrethroids used for these barriers are relatively inexpensive and last for several years. The disadvantage is that termites are able to detect these termiticide barriers in the soil and avoid lethal contact with them. This is important because applying a perfect barrier under a fully constructed house is very difficult. Construction features, plumbing lines, and landscaping are just a few of the obstacles that hinder liquid termiticide application. Because of these difficulties, there are often gaps in the treatment where the termiticide was not applied completely. Eventually, foraging termites may locate these gaps and gain access into the structure. If these termites find the structural wood, they will tunnel back and forth through the untreated gap and recruit other termites into the building.

Non-Repellent Termiticides

At the time of this writing there are a few non-repellent termiticide treatments available on the commercial market. These chemicals are not repellent and termites cannot detect them in the soil. Therefore, the termites tunnel into the termiticide while foraging, contact the chemical, and die.

Premise (Bayer Corporation, Kansas City, Mo.) contains the active ingredient imidocloprid. Imidocloprid is unique because it not only kills termites that contact a lethal dose, but it also kills them at doses too small to cause immediate death. If a termite contacts even a very small amount of imidocloprid it will become lethargic and forget to eat and feed other termites. It will also forget to groom itself so it soon becomes infested with soil fungi. The termite eventually dies as a result of these indirect symptoms of imidocloprid exposure. A disadvantage to Premise liquid termiticide is that it is somewhat more expensive than the pyrethroid termiticides. Note: Premise is also available in a foam aerosol formulation. The foam is used for spot treatments, where it is injected directly into termite galleries in the infested wood.

Termidor (BASF Corporation, Research Triangle Park, N.C.) is also a non-repellent termiticide. The active ingredient is fipronil. Fipronil is unique in that it can be transferred from one termite to another through contact and trophallaxis (communal feeding). This allows it to affect more termites than those that contact the chemical directly. The advantage of this product is its long-term effectiveness in the soil. Test data indicate that fipronil may be effective longer after the initial application than other liquid termiticide products. A disadvantage is that Termidor is more expensive than other liquid termiticides.

Phantom (BASF Corporation, Research Triangle Park, N.C.) is another non-repellent termiticide. The active ingredient in Phantom is chlorfenapyr. Chlorfenapyr is an insecticide that is not toxic to the insect until it is broken down by enzymes in the insect's immune system. Once broken down, the toxic metabolites of chlorfenapyr stop the insect cells from producing energy. The termites die because they cannot produce the energy needed to function. Because of its mode of action, termites contacting Phantom do not die immediately but live long enough to carry some of the termiticide away in their gut and on their bodies. These termites live long enough to transfer (through contact and trophallaxis) some of the termiticide to their nest mates. This trans-

fer produces secondary kill within the colony. Like the other non-repellent termiticides, Phantom is also more expensive than the pyrethroid formulations.

Liquid Termiticides

Advantages

- Intended to provide immediate protection for the structure
- Lasts multiple years in the soil
- Non-repellent termiticides eliminate the problem of termites locating “gaps” in the treatment
- Relatively inexpensive compared to baiting systems (see below)

Disadvantages

- Even the most conscientious pest management professional will have difficulty putting down a chemical blanket that is free of “gaps.” Gaps in repellent termiticide applications may later provide access to termites.
- Liquid termiticide applications can be disruptive to the structure, requiring that porches, stoops and even the slabs be drilled through at 12-16” intervals so that the liquid can be injected into the soil along the foundation walls. Even though these drill holes are later plugged, they are still visible after treatment.
- Liquid termiticides applied within 50 feet of a body of water, well, or cistern are a water contamination risk. However, it is not illegal to use liquid termiticide near these areas. A treatment method where the soil around a structure is removed, treated, dried and replaced is frequently used where water contamination is a concern. However, this treatment method does not eliminate the risk of the chemical leaching into a water source over time. In areas of potential water contamination, termite baiting is a better option.

Subterranean Termite Baits

Termite baiting takes a very different approach to subterranean termite control than liquid termiticide application. Instead of attempting to protect a structure by creating a chemical blanket between the building and the termites, baiting targets the termites themselves. Termite baits are designed to suppress or eliminate the

termite colony living in the soil.

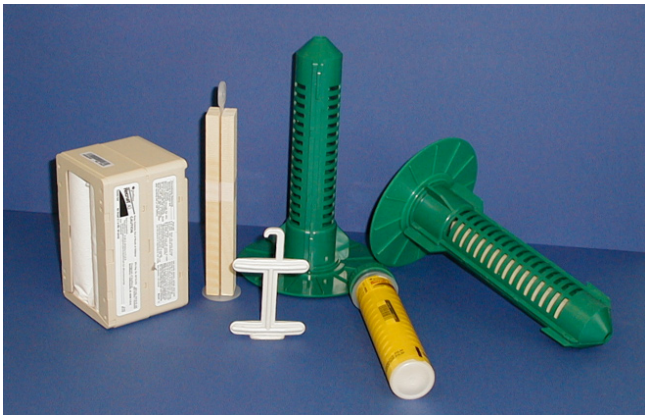
The first commercial termite baiting system became available in 1995. Since that time, several termite baiting systems have been developed. The most widely used bait products are applied very similarly. The initial installation of any baiting system involves plastic stations being inserted into the ground around the periphery of the structure approximately every 10 feet. Inside these stations are untreated wood monitors. The stations are usually inspected either once a month or every 3 months (quarterly) for termite activity. If live termites are found in the station, a toxic bait will be placed inside and the infested monitor may or may not be removed. The idea is to get the termites that have been recruited to the wood monitor to now pick up the bait instead. Certain bait products are intended to be used by themselves, while others can be used in combination with a spot applications of liquid termiticide (applied only to areas where termites are active) or a complete liquid treatment.

Because the in-ground bait stations are placed outside the structure, they do not directly affect termites that are already foraging inside. To address these inside infestations, certain manufacturers provide above-ground stations. Above-ground stations are basically plastic boxes that contain a paper matrix (bait) laced with the active ingredient (toxicant). The boxes can be attached over a termite mud tube or directly onto infested wood. The termites forage inside the box and consume the paper bait.

The following is a description of the most widely used baiting systems available on the commercial market.

Sentricon System – The Sentricon system was the first termite baiting system commercially available. It is now the most widely used bait system within the United States and internationally. It was developed in 1995 by Dow AgroSciences (Indianapolis, Ind.) and the University of Florida as a stand-alone baiting system. Sentricon was not intended for use in combination with liquid termiticide because at the time of its development, only repellent termiticides were available. If a repellent termiticide contaminated a bait station, termites would turn away from the station, rendering it useless. However, now that non-repellent termiticides are available, Sentricon can be used in combination with a non-repellent termiticide.

The bait system consists of in-ground stations that contain 2 pieces of untreated wood (“monitors”). The stations are checked at first monthly and then on a quar-



Major components of the Sentricon Termite Baiting System.

terly schedule to see if termites have invaded or “hit” the monitors. If so, the termites are collected from the monitors and placed inside a tube of bait. The bait then replaces the monitors in the station and the termites must then eat their way out of the bait tube.

The Sentricon System is marketed as a termite colony elimination system. In order for a colony elimination system to work, the bait must affect almost every termite in the colony. Worker termites do all of the foraging, so how does the bait get from the worker termites to the rest of the colony? Remember that the worker termites are responsible for feeding all of their nest mates. They do this by consuming food themselves then regurgitating part of it into the mouths of the other colony members. This same natural behavior is exploited by the Sentricon system to disperse the bait toxicant throughout the termite nest. It is important to note that the bait cannot work too fast. If the active ingredient killed the termites too rapidly, the worker termites would die before they could pass the bait to other colony members.

The active ingredient in the Sentricon bait is noviflumuron, a slow acting toxicant. Noviflumuron is an insect growth regulator (IGR). IGRs interfere with the insect’s physical development. This particular IGR interferes with the insect’s ability to molt. Insects have their skeleton on the outside of their bodies, an exo-



Inserting the noviflumuron bait tube into the station.

skeleton. In order to grow larger they must periodically shed this exoskeleton in a process called molting. Noviflumuron does not allow the termite to molt properly, so it dies in the process. When noviflumuron is passed from one termite to another, the affected termites die during their next molt. In time, there are too few termites left to take care of the colony and feed the queen. When the queen dies the colony is eliminated.

The Sentricon system also supplies above ground stations that the pest management professional (PMP) can place directly on termite mud tubes or infested wood. Noviflumuron is the active ingredient in the above ground stations as well.

Exterra System – This system was developed by Ensysyex (Fayetteville, N.C.) and can be used either as a stand-alone bait or in combination with any liquid termiticide. The Exterra bait station is lined with strips of untreated wood, called “interceptors”. The center of the station is left empty until termites hit the station. When the station is hit, bait is placed in the center of the station but the interceptors are left in place so that termite feeding is not disturbed.

The Exterra stations are larger than other commercial bait products so the inspection interval for the large stations is usually 45-90 days. The longer interval between inspections may make the Exterra system relatively easy to maintain when compared with other systems. However, it may be possible for termites to completely consume the interceptors and abandon the station before the hit is discovered and baited. Baited stations where termites have been active are usually checked at one-month intervals.

The active ingredient in the Exterra bait is diflubenzuron (dimilin). Like noviflumuron, diflubenzuron is a slow acting insect growth regulator that is passed from termite to termite by trophallaxis. Diflubenzuron also interferes with termite development by killing them during the molting process. Thus, like Sentricon, Exterra is a colony elimination system. As of this writing, Ensysyex does not offer above ground bait stations.

FirstLine System – (FMC Corporation, Philadelphia, Pa.) The FirstLine bait system was developed for use in combination with spot treatments of liquid termiticide. The bait system resembles the Sentricon system in that the stations are inspected monthly or quarterly and the untreated wood monitors inside the stations are replaced with bait if there is a termite hit.

The active ingredient in the FirstLine system is sulfluramid. Sulfluramid is a stomach toxicant that interferes with the termite's ability to produce energy. Sulfluramid is faster acting than either noviflumuron or diflubenzuron. However, in the FirstLine system the concentration of sulfluramid is so low that exposed termites survive for approximately 3 weeks. This allows them enough time to pass the toxicant to other members of the colony. However, the FirstLine system does not eliminate termite colonies but is a colony suppression system only. Therefore, remediation of an active infestation comes from the combined treatment of baiting the termite colony and applying liquid termiticide at the site of infestation. FMC also provides above ground bait stations as part of the FirstLine system.

Subterfuge – This termite bait product is manufactured by BASF Corporation (Research Triangle Park, N.C.). The active ingredient, hydramethylnon, a slow acting stomach toxicant. The delayed activity of hydramethylnon allows the bait to be passed from termite to termite before the onset of any lethal effects. Therefore, more termites in the colony are killed than eat the bait directly. Like other baiting systems the in-ground stations are installed every 10 feet around the perimeter of the structure with additional stations installed in areas where conditions are favorable to termites. However, unlike the other baiting systems, Subterfuge does not use wood monitors. Instead, every station has active bait put into it at the time of installation.

Advance Termite Bait System – This is the most recent bait product on the termite baiting market. The active ingredient in the Advance system is diflubenzuron (the same active ingredient as the Exterra system described above). Installation intervals are for in-ground stations is every 10 feet around the perimeter of the structure with additional stations placed in locations with conditions conducive to termites. Inspections occur at 30 days after installation and quarterly thereafter unless one of the stations has had a termite “hit.” “Hit” stations are inspected every month.

Spectracide Terminate – Terminate is a consumer termite bait product that is available at hardware and home stores. It is manufactured by United Industries Corp. (St. Louis, Mo.) and is a stand-alone system. Monitoring is not part of the Terminate baiting process. The active bait is inside of the stations at the time of purchase. The bait instructions direct the homeowner to place the stations in the soil near infested locations within the structure and in areas that retain moisture. Like the FirstLine system, the active ingredient in the

Terminate is sulfluramid. Terminate is intended to suppress termite activity in a localized area. Although the Terminate product does kill termites, as of this writing, there is no research documenting that Terminate can prevent or eliminate subterranean termite infestation.

Professional Termite Baiting Systems

Advantages

- Baits are very environmentally friendly because there is considerably less active ingredient put into the environment compared to the hundreds of gallons of diluted insecticide used in liquid treatments.
- Termite baits are ideal for use around structures inhabited by persons with chemical sensitivity.
- In situations where the infested structure is within 50 feet of a well or 100 feet of a body of water, termite baits may be the only treatment option.
- Bait installations generally do not require any drilling of the porch, slab, or foundation walls, so there is not damage to the structure.

Disadvantages

- There are no means of coaxing termites into stations that are being monitored so it may take months before baiting can begin.
- Professional baiting systems are generally more expensive than liquid termiticide treatments because of the inspection requirements.
- Termite baiting systems when used alone do not protect the structure directly. Termites feeding within the structure will continue to do so until the colony is eliminated or they are controlled with an above-ground station.

References

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Subterranean Termite Treatment Cheat Sheet

Control Method	Repellent Liquid Termiticide	Non-repellent Liquid Termiticide	Bait Systems
How it is supposed to control subterranean termites	The termiticide is injected into the soil around the foundation of the home. The slab is drilled and the soil treated underneath. Trenches are dug around the foundation outside and within crawl spaces and filled with termiticide. The termiticide repels the termites and ideally turns them away from the structure.	The structure is drilled, trenched and the soil injected with the liquid, but the termiticide is not repellent to the termites. The termites cannot detect the non-repellent termiticide in the soil, so they tunnel into it and pick it up on their bodies. They can also transfer the toxicant to other termites before they die.	Wood monitoring stakes are inside stations placed in the ground around the structure. The stations are inspected monthly or quarterly. If termites are found inside a station, bait is put in. Termites consume the bait but live long enough to return to the nest. There they feed the bait to their nest mates, thus killing a greater portion of the colony.
Termiticide products used by Certified Pest Management Professionals	Tribute, Demon TC, Drag-net, Prelude, Prevail, Talstar and Torpedo	Premise Termidor Phantom	Sentricon Exterra FirstLine Subterfuge Advance
Relative costs	Usually the least expensive of the 3 treatments. Preparing for the injection of the liquid is labor intensive and the greatest source of the cost. Many gallons of termiticide are used in the treatment (~ 4 gallons /10 linear feet per foot of depth to the footer).	Can be more expensive than repellent liquids because the termiticide is more costly. The application is the same as the repellent treatment so labor costs are equivalent.	Baiting systems are often the most expensive type of treatment. The station installation, monitoring trips to the home, and annual renewal are responsible for the cost. However, many PMPs offer a substantial damage warrantee as an incentive for purchasing bait systems. Damage warrantees are almost never offered with liquid treatments.
Treatment longevity	Under optimal conditions repellent termiticides can last ~ 5 years	Premise 5 + years Termidor 5 + years Phantom 5 + years	Continuous process of monitoring with baits applied as necessary.
Control Method	Repellent Liquid Termiticide	Non-repellent Liquid Termiticide	Bait Systems

Advantages	Provides immediate protection for the structure. Relatively low cost and long lasting.	Provides immediate protection for the structure. Most effective treatment because it kills foraging termites.	Baits are environmentally friendly (no water contamination). They present almost no exposure risk to humans and pets. Structure does not have to be drilled to install a bait system.
Disadvantages	Termites may not be killed, just turned away from the chemical. They often find tiny gaps in the treatment and tunnel through them to the structure. Requires drilling of the structural features to get a complete application.	Requires drilling of the structural features to get a complete application.	Structure not directly protected. There is no way to attract termites into the monitors, so actual baiting may take a long time to begin. This leaves the structure at risk.