

Influence of pH 11 Water on Termiticide Degradation in Arizona

*Paul B. Baker, Ph.D.
Specialist in Entomology
Department of Entomology
University of Arizona*

Abstract

Termites continue to be Arizona's number one urban pest. Factors that influence the persistence of termiticides are constantly under investigation. High pH has been identified as a potential concern for persistence in termiticides. I studied the influence of pH 11 water on five termiticides applied to commercial ABC fill 10 months post-treatment. In general, the addition of pH 11 water had little influence on termiticide persistence under Arizona conditions. Initially plots treated with Ph 11 water had higher residues than those that did not receive the treated water; over time these differences diminished.

The use of termiticides to halt the invasion of termites is well documented (Kard, et al 1989, Gold et al, 1996 and Su, et al 1993). However, termites continue to be Arizona's number one urban pest (Potter, M.F. 1997). Factors that influence the persistence of termiticides have been the subject of many studies by both researchers and registrants. A potentially important factor is the influence of high pH water on the degradation of termiticides. The pH of water in contact with cement may vary from 9 to 12 (F.M. Lea, 1971) depending on the cement, lime and calcium carbonate proportions. I studied the influence of pH 11 water on five termiticides applied to commercial ABC fill for 10 months post-treatment. The results of the study are reported here.

Using a randomized complete block design, I tested the following termiticides: permethrin (Dragnet @ 0.5% A.I.), fenvalerate (Tribute @ 0.5% A.I.), chlorpyrifos (Dursban TC @ 1.0% A.I.), bifenthrin (Biflex @ 0.06% A.I.), cypermethrin (Prevail @ 0.25% A.I.) and a control. We constructed 36 wood frames, each 5.08cm x 5.08cm x 15.24 high, using 5.08cm x 15.24cm lumber. The frames were placed on the ground and commercial ABC fill (pH 8.3, EC>15, sand 77%, silt 12%, clay 11%) was placed in all 36 frames. All termiticides were mixed as per manufacturer's recommendations and applied to six plots each. Spray mixtures were applied at 1 gallon/10 square feet. All treatments were covered with 5.08cm x 5.08cm x 1.3cm plywood covers. A concrete block was placed on top to hold the cover in place. Four hours later we applied pH 11 water to three of the six replications of each termiticide treatment and control plots. Sodium hydroxide was added to water in 0.1 gram increments until the water reached pH 11 using Litmus paper as an indicator. Covers were removed and 1.9 liters of pH 11 water was applied to all plots, then plywood covers were replaced. After 20 minutes, using a stainless steel sampler with a clear plastic sleeve, I took samples to a depth of approximately 7.6cm. Samples were taken at 0, 1, 2, 4, 16, 32 and 302 days post-treatment. Soil samples were frozen and shipped to FMC's Agricultural Products Group in Princeton, NJ for analysis. Samples were processed according to APG Test Methods 256, 257 and 376. All samples were removed from their plastic holders, air dried on aluminum foil at room temperature for 24 hours, then gently crushed to pass through a 2 mm sieve, extracted in triplicate with 50/50 (v/v) hexane/acetone, and analyzed by gas chromatography with electron capture detection.

In general, the addition of pH 11 water had little influence on termiticide degradation (Figures 1-5). Analysis

of variance and Duncan's Multiple Range test revealed no differences between pH 11 treated soil and controls ($P > .05$) except in the case of Dragnet (Fig 3) which did show significant statistical differences ($P < .05$) between treated soil and controls. Initially plots treated with pH 11 water had slightly higher concentrations than those that did not receive the treated water. Over time these differences diminished. The residues detected at 0 to 32 days post-treatment were similar to those found in a 5-year termiticide degradation study that was located adjacent to the pH 11 study (Baker, unpublished data). Biflex (Fig. 1) and Dragnet (Fig. 3) showed the greatest persistence throughout the duration of the 10-month study. Prevail (Fig. 2) and Dursban (Fig. 5) exhibited losses of over 78% to 94% respectively by the 302-day sampling date. Fenvalerate (Fig. 4) displayed variability throughout the study but maintained its initial concentration by the last sampling date.

The data implies that some termiticides degrade rapidly within 10 months under Arizona conditions. However, our results suggest that the addition of pH 11 water had little or no influence on that degradation.

References Cited

Gold, R.E., H.N. Howell, Jr., B.M. Pawson, M.S. Wright and J.C. Lutz. 1996. Persistence and bioavailability of termiticides to subterranean termites (Isoptera: Rhinotermitidae) from five soil types and locations in Texas. *Sociobiology* 28(3): 337-363.

Kard, B.M., J.K. Mauldin and S.C. Jones. 1989. Evaluation of soil termiticides for control of subterranean termites (Isoptera). *Sociobiology* 15(3): 285-297.

Lea, F.M. 1971. *CRC Handbook of Chemistry and Physics* (6th edition) 1986-1987. Chemical Publishing Co. Inc. New York, 177-185.

Potter, M.F. 1977. *Handbook of Pest Control* (8th edition) Chapter 6. Termites. Mallis Handbook and Technical Training Co.

Su, N.-Y., R.H. Scheffrahn, and P.M. Ban. 1993. Barrier efficacy of pyrethroid and organophosphate formulations against subterranean termites (Isoptera: Rhinotermitidae). *J. Econ. Entomol.* 86(3) 772-776.

Fig. 1. Biflex, pH 11 Study - Tucson, AZ 1997

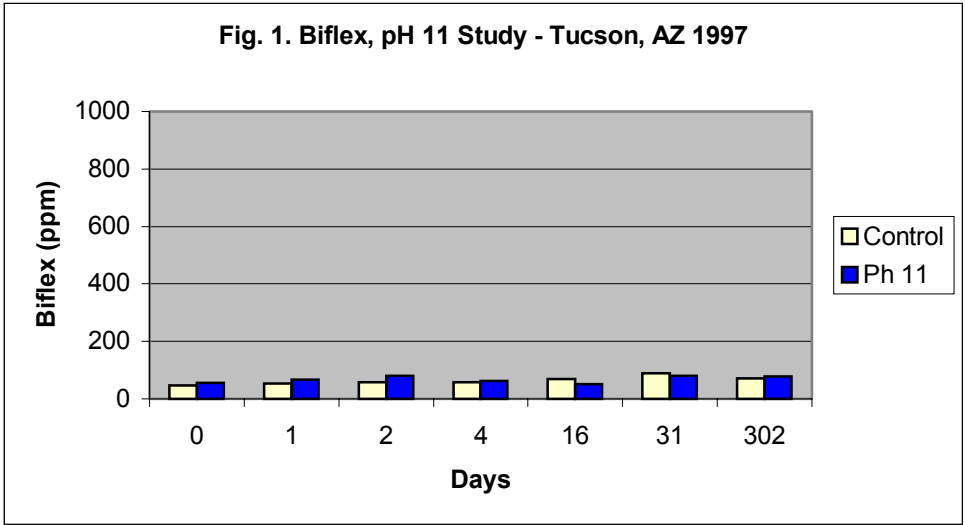


Fig. 2. Prevail, pH 11 Study - Tucson, AZ 1997

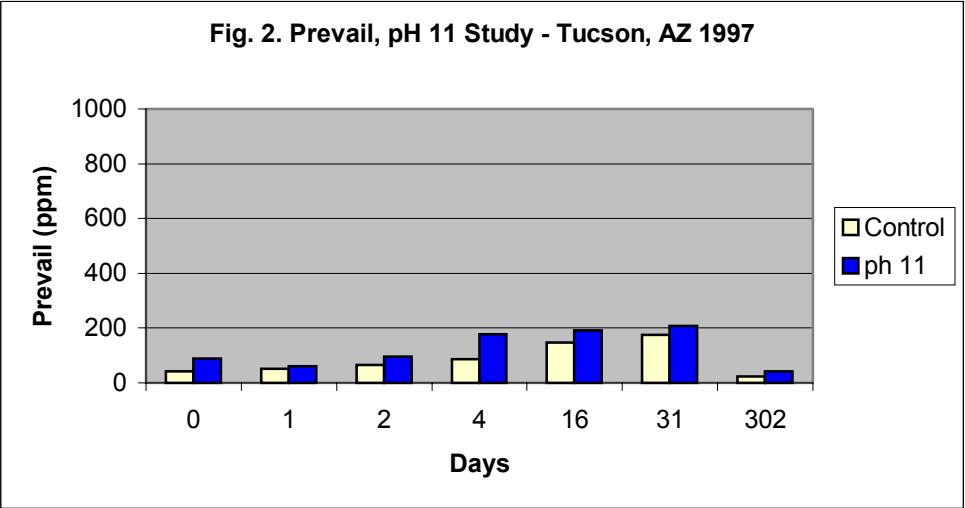


Fig. 3. Dagnet, pH 11 Study - Tucson, AZ 1997

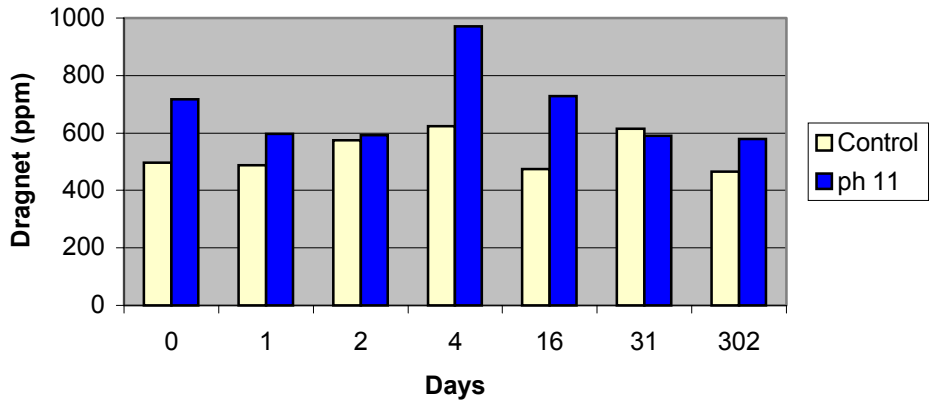


Fig. 4. Fenvalerate, pH 11 Study - Tucson, AZ 1997

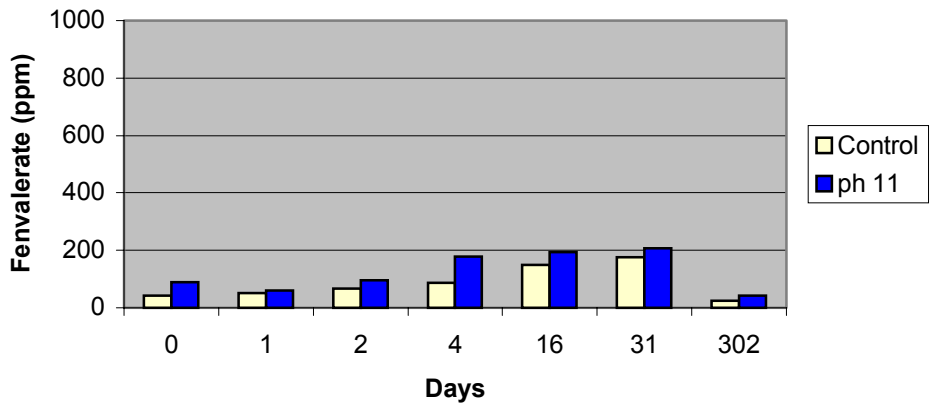


Fig. 5. Dursban, ph 11 Study - Tucson, AZ 1997

