The EFFECT of ELEVATED SOIL pH from MASONRY CEMENT on RESIDUAL SOIL TERMITICIDE PERFORMANCE

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Eastern subterranean termites (*Reticulitermes flavipes* (Kollar)) were confined to sand of different pH levels, which was treated with either chlorpyrifos (10,000, 1,000, 100, or 10 ppm Dursban TC), imidacloprid (500, 50, 5, or 0.5 ppm Premise 2), fipronil (600, 60, 6, or 0.6 ppm Termidor), bifenthrin (600, 60, 6, or 0.6 ppm Talstar), permethrin (10,000, 1,000, 100, or 10 ppm Prelude), and cypermethrin (5,000, 500, 50, or 5 ppm Demon TC), initially after treatment and after sand was aged five and 10 months. Twenty-four hour mortalities were subjected to one-way ANOVA to determine if mortality was affected by addition of powdered Portland cement and moisture to elevate sand pH. Before the bioassays, pH of the field-collected, sieved, and oven-dried loamy sand was determined after several minute additions of Portland cement. Distilled water was added weekly to sand for 10 months while it was held in darkness at room temperature and humidity, and pH of control sand was determined at five and 10 months. Sand starting at pH 5.6 required 0.045%, 0.14%, 0.45%, and 0.88% of its weight in cement to raise the pH levels to 6, 7, 8, and 9, respectively.

Concentrations of ≥10 ppm chlorpyrifos and permethrin, ≥50 ppm imidacloprid, ≥6 ppm fipronil, ≥0.6 ppm bifenthrin, and ≥5 ppm cypermethrin killed all termites exposed immediately after sand treatment. Mortalities of termites exposed to the higher termiticide concentrations were still 100% at the 10-month bioassay period for sand of all pH levels. However, for most chemicals tested, low concentrations, which are indicative of the variation that can occur from nonuniform soil termiticide treatment, were affected by pH. One-way ANOVA of the effect of pH on mortality revealed that 10 ppm chlorpyrifos, 50 ppm imidacloprid, 6 ppm fipronil, 0.6 ppm bifenthrin, and 10 ppm permethrin all caused significantly less mortality of termites held on sand aged for 10 months at pH level 9 (0 - 28.9%) versus sand pH's 6, 7, and 8 (7.77 – 100.0%) for all treatments except cypermethrin, which killed all termites at all concentrations at all pH levels for the three bioassays.

Linear regression analysis revealed that the most significant decreases in mortalities of exposed termites occurred during the five-month bioassay versus the 10-month bioassay. At the 5-month point, pH of control sand treated with only distilled water was still at approximately initial levels. After aging for 10 months, termite mortality from termiticide-treated sand was significantly lower while pH of all control sand was under 7.

The results of this study suggest that termiticide soil treatments may begin to degrade immediately. Low chemical concentrations caused by nonuniform distribution of termiticides will abate more quickly than higher concentrations, which may lead to treatment failures.

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