TOXICITY AND REPELLENCY OF THE FUNGICIDE TCMTB TO THE EASTERN SUBTERRANEAN TERMITE (ISOPTERA: RHINOTERMITIDAE)

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Prophylactic preservative treatments are important means of protecting wood in service from infection by mold, stain, and decay fungi, and infestation by wood-boring insects. The search for new wood preservatives has been stimulated by concerns over possible ill effects on human health of the most commonly used materials: creosote, pentachlorophenol, and inorganic arsenicals (Brooks 1983). One compound of current interest is the fungicide 2-(thiocyanomethylthio)benzothiazole (TCMTB), which has a mammalian oral LD_{50} of 1590 mg/kg (Thomson 1985). This compound is an effective antisapstain agent (i.e., inhibiting growth of wood-staining fungi) (Drysdale 1987; Oteng-Amoako 1988), and has low leachability in soil (Duguet and Dartigues 1988; Konabe 1987). TCMTB is used agriculturally as a seed treatment, is available in several formulations as an antisapstain agent and wood preservative, and is marketed for incorporation into paints, caulking compounds, sealants, adhesives, and particle board resin. Although it has been combined with the insecticide deltamethrin (Duguet and Dartigues 1988), little information is available on the insecticidal properties of TCMTB alone.

Along with those of other candidate wood preservatives, the toxicity and behavioural effects of TCMTB on the eastern subterranean termite, *Reticulitermes flavipes* (Kollar), were recently evaluated using Busan 1030 (Buckman Laboratories of Canada, Ltd., 613 Orly Avenue, Dorval, Quebec H9P 1G1), a 30% active formulation of TCMTB (Buckman Laboratories 1985). This formulation was diluted in methanol and applied uniformly by pipet to each side of individually weighed oven-dried filter papers (9 cm Whatman No. 1) to obtain precise percentage (weight of solute / weight of substrate) deposits of the active ingredient (TCMTB). Papers containing weight/weight percentages of 0.1%, 1.0%, and 5.0% TCMTB, and a methanol-treated control paper, were cut into strips ca. 2 x 6 cm (ca. 69 mg), oven-dried (2 hours, 75°C), and placed along one side of polystyrene snap-cap vials (Canlab No. V3001-212, 44.8 ml, 60 x 35 mm diameter) containing 10 g oven-dried brick sand and 1 ml deionized water. Thirty *R. flavipes* workers (externally undifferentiated individuals older than the third instar as determined by size) were placed in each vial, which was then capped and placed in an unlighted temperature (27 ± 0.5°C) and humidity (90 ± 5% RH) controlled cabinet. The termites were collected from Scarborough, Ontario, in a trap consisting of corrugated cardboard rolled within a capped ABS pipe (ca. 10 cm ID x 15 cm L) (LaFage *et al.* 1983) placed on top of an infested maple stump. They were held in the temperature cabinet in plastic containers containing moist cardboard, and used within 30 days of collection.

Immediate mortality following a 24 hour and a 7 day exposure to TCMTB, and feeding during the 7 day exposure were respectively evaluated by counting surviving termites and weighing the oven-dried papers at a precision of 0.01 mg. To evaluate delayed post-exposure mortality, termites were removed from the original vials after the 24 hour and 7 day exposure periods, placed in new vials containing the same amount of sand and water and untreated filter paper strips, and recounted after an additional 9 days. Each treatment was replicated three times and results subjected to analysis of variance (ANOVA) and the Ryan-Einot-Gabriel-Welsch (REGW) Multiple F Test (SAS Institute Inc. 1987). Proportions were compared with multiple Z tests using Bonferroni's inequality to maintain $\alpha \leq 0.05$ (Dixon and Massey 1983).

During both the 24 hour and the 7 day exposure periods, the termite workers clustered on the opposite side of the vials from the Busan 1030 treated papers, although tunneling in the sand adjacent to the papers indicated that exploration occurred. Repellency was confirmed by the absence of any detectable feeding on the TCMTB treated papers (no weight loss, independent of TCMTB concentration) during the 7 day exposure, although the control papers averaged a weight loss of 8.8 ± 0.5 µg (ca. 13% of their original weight).

No significant immediate or post-exposure mortality occurred as a result of the 24 hour exposure

TABLE I. Percentage mortality of *Reticulitermes flavipes* workers immediately after exposure to various concentrations of TCMTB, and 9 days post-exposure.*

	24 Hour Exposure		7 Day Exposure	
Dosage	**Immediate**	**Post-Exposure**	**Immediate**	**Post-Exposure****
5.0 %	1 ± 2a	22 ± 2ab	48 ± 10a	100a
1.0	2 ± 2a	26 ± 2a	38 ± 13a	97ab
0.1	3 ± 3a	20 ± 3b	37 ± 10ab	67b
Control	1 ± 2a	23 ± 3ab	17 ± 0b	24c

*Mean± standard deviation. N = 3 groups of 30 workers. Means in each column followed by different letters are significantly different (ANOVA, REGW Multiple F Test, $\alpha \leq 0.05$).

**Survivors from 7 day exposure were pooled. Percentages followed by different letters are significantly different (Z test of proportions, $\alpha \leq 0.05$).

period (Table I). However, significant mortality, increasing with TCMTB concentration, during and after the 7 day exposure suggests that prolonged confinement with a treated substrate exposes the insects to either contact toxicity or fumigant action despite their behavioural avoidance response.

Compounds modifying subterranean termite behaviour may play an important role in future pest control strategies (Grace 1987; Rust *et al.* 1988). Thus, candidate wood preservatives should be evaluated not only in terms of toxicity assays and field (stake) tests, but also in terms of their effects on insect behaviour. A low (0.1%) concentration of TCMTB, while showing limited toxicity to *R. flavipes*, may, by deterring feeding, provide protection equivalent to that of higher insecticidal concentrations or more active insecticidal agents.

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Photodegradation of Emerging Contaminant 2-(tiocyanomethylthio) Benzothiazole (TCMTB) in Aqueous Solution: Kinetics and Transformation Products. Crislaine Bertoldi. 1,2Â Direct photolysis of the emerging contaminant 2-(thiocyanomethylthio) benzothiazole (TMCTB) was performed in aqueous solution at different concentrations with high-pressure mercury lamp (5.0, 8.0, 13.0, 16.0, 20.0, 23.0, 27.0, 35.0, 40.0, 45.0, and 50.0 mg Lâˆ' 1) and with natural sunlight radiation (6.0, 30.0, and 60.0. mg Lâˆ' 1). TCMTB underwent rapid degradation by direct photolysis with a high-pressure mercury lamp in aqueous solutions, with 99% removal after 30 min at all concentrations studied. Alibaba.com offers 811 fungicide tcmtb products. About 0% of these are Fungicide, 0% are Electronics Chemicals, and 0% are Leather Auxiliary Agents. A wide variety of fungicide tcmtb options are available to you, such as classification, grade standard, and usage.Â Â·Â·Â· 0-6Â°C CAS DataBase Reference 21564-17-0(CAS DataBase Reference) NIST Chemistry Reference Thiocyanic acid, (2-benzothiazolylthio)methyl ester(21564-17-0) EPA Substance Registry System Thiocyanic acid, (2-benzothiazolylthio)methyl ester(21564-17-0) TCMTB 30% 60% Specification Item Specifications Appearance kermesinus to primrose yellow liquid Purity ≥ 60.0% PH value N eutral Moisture ≤ 0.5% Burning. (Benzothiazol-2-ylthio)methyl thiocyanate (TCMTB) is a chemical compound classified as a benzothiazole. TCMTB is an oily, flammable, red to brown liquid with a pungent odor that is very slightly soluble in water. It decomposes on heating producing hydrogen cyanide, sulfur oxides, and nitrogen oxides. The degradation products are 2-mercaptobenzothiazole (2-MBT) and 2-benzothiazolesulfonic acid. of. TCMTB, while showing limited toxicity to. R. jlavipes, may, by deterring feeding, provide protection equivalent to that.Â The title compounds 4aep were screened for antimosquito properties such as repellency, insecticidal and larvicidal activity against Anopheles arabiensis by mosquito feeding-probing assay, cone bio-assay and standard WHO larvicidal assay, respectively. Among these analogous 4b, 4d and 4p exhibit the highest repellent activity comparable to the positive control DEET, and 4a and 4k knockdown most mosquitoes on repellent assays. Ã“ 2013 Elsevier Masson SAS. All rights reserved. According to repellency tests, by increasing concentration of oils, the repellency effects were increased. The most potent repellency effect was recorded for clove, followed by spearmint and cumin oils. The three extracted essential oils seem to be suitable sources of active vapors that can be used as alternatives for chemical pesticides for controlling this pest.Â @article{Kheradmand2015ToxicityAR, title={Toxicity and Repellency Effects of Three Plant Essential Oils Against Two-spotted Spider Mite, Tetranychus urticae (Acari: Tetranychidae)}, author={K. Kheradmand and S. Beynaghi and S. Asgari and A. S. Garjan}, journal={Journal of Agricultural Science and Technology}, year={2015}, volume={17}, pages={1223-1232} }.