

Laboratory Evaluation of Efficacy of Orange Oil (XT-2000) for Control of Drywood Termites in Naturally-Infested Boards

- Orange oil, d-limonene oil extracted from orange fruit peels, is currently available as XT-2000 for localized treatment of drywood termites.
- Efficacy of orange oil (XT-2000) for control of western drywood termite, *Incisitermes minor*, was evaluated in a laboratory study of infested wood boards¹.
- Prior to treatment, wood boards were confirmed to be infested with live drywood termite colonies using non-destructive detection methods: X-rays, and sensors that detect termites moving or chewing wood.



- Completely exposed boards were drilled and treated by an experienced pest control operator. Three boards were tested per treatment; including XT-2000 (92% orange oil), water only, and untreated control.
- Holes were drilled using a “W” pattern and were spaced about 2 Inches apart² along the entire length and width of each board. Each hole was injected with the treatment. The maximum volume of orange oil that could be absorbed by the wood was injected.
- Three months after treatment, all boards were cut into small fragments to extract and count live and dead drywood termites. Live termites were found in all treatment boards. Termite survival was high in both control treatments, while an average of 19% of the termites survived the orange oil treatment (see table below).

Treatment	Total No. Drywood Termites (Three Boards/Treatment)				Average Survival ^b
	Live	Dead	Casualties ^a	Total	
Orange Oil (XT-2000)	336	1,105	9	1,450	18.7%
Water Control	1,090	35	1	1,126	94.2%
Untreated Control	961	38	30	1,029	96.4%

^aCasualties include termites destroyed in the extraction process, and were not included in % Survival calculations.

^b% Survival = Sum of % survival [# Live / (# Live + # Dead)] for each board divided by 3 (number of boards tested)

- These results demonstrated that even in a best case scenario with complete access to infested wood and thorough coverage at the maximum application rate, orange oil (XT-2000) obtained only 81% control of drywood termites.
- Whole-structure fumigation is the most effective method documented to provide complete control of drywood termites in structures, including colonies in areas inaccessible for localized treatment.³

¹Dr. Vernard Lewis, University of California, Berkeley, CA. 2008.

²XT-2000 label suggests wider intervals (3-5 inches) for drilling injection holes

³Scheffrahn et al. 1997. J. Econ. Entomol. 90: 492-502; Lewis and Haverty. 1996. J. Econ. Entomol. 89: 922-934.