

Laboratory Assays to Evaluate Insecticide Product Efficacy (Knockdown, Residual Activity, and Potential Repellency) for Control of Bed Bugs (*Cimex lectularius* L.)

Report for

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Objectives:

1. To quantify and compare the mortality of bed bugs confined on fabric impregnated with a proprietary dust.

Materials and Methods

1. **Start:** June 29, 2009
Completion: July 10, 2009

2. Test Facilities:

Laboratory assays were conducted at the Dodson Urban Pest Management Laboratory (DUPML), Virginia Tech campus in Blacksburg, Virginia.

3. Bed Bug Rearing:

Kramer (resistant) strain bed bugs were used in the laboratory assays. The Kramer strain bed bugs have been in colony at the DUPML since February 2006. The bed bugs are currently maintained on a diet of blood obtained from human volunteers (VT IRB #06-165). The bed bugs are fed every 7 d for 30 minutes. Bed bugs are housed in glass mason jars containing a folded cardboard for harborage. Jars are closed with a mesh top to allow feeding through the mesh without opening the jar. Rearing jars are kept in an environmental chamber at 27° C, 55% RH, and on a 12:12 L:D photoperiod.

4. Bioassay Designs

1. *Bedbug response to insecticide treated fabric:* Groups of ten adult Harlan strain bed bugs were removed from rearing containers without anesthesia and confined within a Petri dish. Samples of treated and untreated fabrics were attached to hardboard panels (7 cm x 7 cm). The Petri dishes containing the bed bugs were inverted onto the cloth so that the dish confined the bed bugs in direct contact with the treated fabric. Each treated fabric had 5 replicates; five control replicates were also run. Bed bug mortality was recorded at regular intervals until 100% mortality was observed. Bed bug mortality was analyzed using Probit analysis (PoloPlus 2001) to determine the LT_{50} value for the treated fabric.

5. Results and Discussion:

Bed bugs confined on dust treated fabric resulted in 100% mortality in 7 days. Twenty percent of the pyrethroid resistant bed bugs died within 18 hours of being confined on the treated fabric (Figure 1). Bed bug mortality increased steadily to 54% by day 2, and 80% by day 4. The calculated LT_{50} value for the resistant strain bed bugs was 1.7 days (Table 1). The LT_{50} value indicates the time (in days) that it took to kill 50% of the insects tested. This value is a good measure of product efficacy because it considers how the “average” bed bug responds to the treatment.

During the course of the test, 4% of the bed bugs (2 out of a total of 50), in the control replicates died. This small amount of mortality is not uncommon in control replicates and should be of no concern in the analysis.

Bed bugs confined on the dust treated fabric die within a week, either through chemical intoxication or through desiccation. One hundred percent mortality within one week should be considered good performance for a non-toxic dust against bed bugs.

Field evaluation of this dust treated fabric would have to be conducted in order to determine further efficacy. However, since dusts have not been found to be repellent to bed bugs, a dust treated fabric that bed bugs are willing to rest upon (for extended time periods) could result in significant mortality.

Table 1. Calculated LT₅₀ for resistant bed bugs confined on dust treated mattress cover fabric.

Strain	Treatment	N	LT ₅₀	95% CIs	Slope \pm SE
Resistant	Dust treated fabric	50	1.74 days	1.40 – 2.1	2.7 \pm 0.23
Resistant	Control	50	No significant mortality		

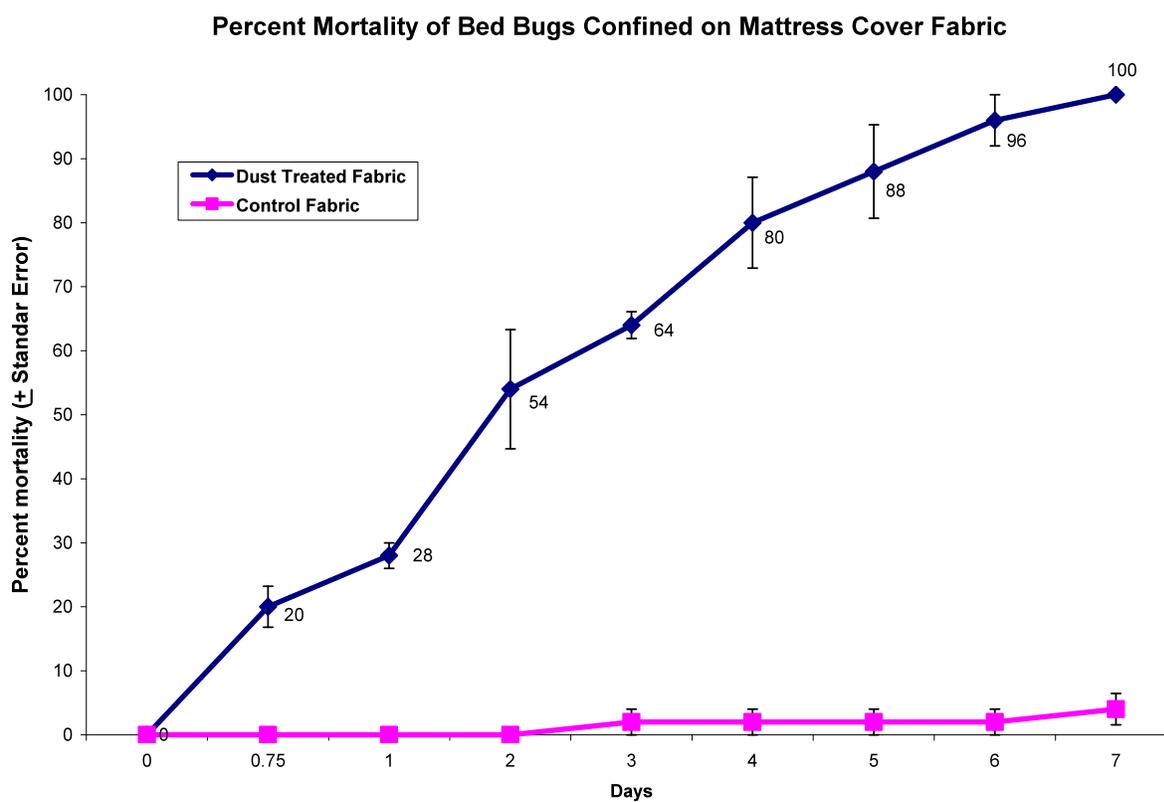


Figure 1. Mean percent mortality of pyrethroid resistant bed bugs confined on dust treated and control fabric.

6. Invoice:**Bioassays:**

Adult Bed Bugs Bioassays	Treatments	Reps	Price per Replicate
Efficacy bioassay			
Kramer strain	Fabric #1 Diatect dust treated fabric	5	\$200.00 / \$1000.00 total
	Controls	5	\$200.00 / \$1000.00 total
Total Bioassays: 2	Treatments: 2	10	Total \$2000.00 Paid Ck# 1001

If you have any questions regarding the report please contact Dr. Dini Miller or Tim McCoy at 540-231-4045. We thank you for your support of our bed bug research program and look forward to working with you in the future.

This report is provided with the understanding that Virginia Tech, Dr. Dini Miller and the Dodson Urban Pest Management Laboratory are NOT endorsing this product over any another, and we will resist any attempts to use our name(s) in advertising literature.