

KiltronX Bed Bug Control Research Program

Preliminary Study to Observe the Effectiveness of Kilspray Product for Control of Bed Bugs (*Cimex lectularius* L.)

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I. INTRODUCTION

KiltronX Enviro Systems LLC (KiltronX) offers bedbug control solutions, including producing and marketing proprietary, Patent Pending products for bedbug control. KiltronX has retained Korlipara Engineering to provide environmental consulting services to assist them in their product evaluation, research, and regulatory review and compliance.

The present report documents the results of a study that was conducted by Korlipara Engineering as part of an ongoing research program by KiltronX. This study was conducted in October 2011 by Korlipara Engineering to observe the effectiveness of their Kilspray product, a proprietary powder formulation that is exempt from EPA registration requirements, in controlling bedbugs.

It should be noted that the scope of this preliminary study for effectiveness is to observe and document the fate of bedbugs in contact with Kilspray in a controlled environment.

II. MATERIALS AND METHODS

1. Start: October 3, 2011
Completion: October 27, 2011

2. Test Facilities:

The test was conducted in the offices of Korlipara Engineering.

3. Bed Bugs:

One hundred (100) susceptible bed bugs of the Harold Harlan strain, supplied by the Department of Entomology, North Carolina State University were used as test subjects. The bedbugs consisted of a mix of male and female freshly fed adults. The bedbugs were fed on September 27th and 28th immediately prior to shipment, and were received at the test site on September 30, 2011.

The bedbugs were received in a closed jar, and all appeared to be in a live condition with movement upon disturbance.

Upon receipt and throughout the test period, the bedbugs were maintained at indoor room temperature conditions (65-70 °F and ~50% RH).

4. Test Setup

Two (2) identical, transparent, plexiglass tanks were utilized for housing the test materials and subjects (bedbugs), one of them to be utilized for the test subjects and the other for the control subjects.

The tanks were rectangular, 12" x 6" x 8" ht., with 2.5-gal capacity each, with a removable top. Prior to test, the tanks were filled with water, and left overnight in that state for an 8-hour period, to test for leaks. The tanks were fully tight and no leaks occurred.

The bottom and up to 2" on all sidewalls of the tanks were covered with untreated KiltreX Fabric, which was then securely taped to the walls. KiltreX Fabric is a KiltronX product, consisting of a composite assembly of a hypoallergenic layer on the top side with a porous layer of fabric underneath. This fabric is intended as a bed liner that can be impregnated with the Kilspray product for long term effectiveness. However, for the present test, KiltreX Fabric was not treated (impregnated with Kilspray), but only used to mimic fabric base condition.

TEST TANK: The top surface of the horizontal portion of the fabric on bottom of the Test Tank was sprayed with wetted Kilspray material. The sidewalls of the fabric were not treated. Approximately one-half of the bedbugs (~50) were then let into the Test Tank and the top was placed back into position and taped to achieve complete seal.

CONTROL TANK: No Kilspray was applied to the Control Tank. The remaining bedbugs, approximately one-half of the total, i.e., ~50 bedbugs, were let into the Control Tank. Since this tank was not treated with Kilspray, the bedbugs are not exposed to this product and, hence, serve as control group for the test for comparison with results for the Test Tank with bedbugs exposed to Kilspray.

The test room had lighting between 06:00 am – 06:00 pm, with remain time either under receding natural light of the evening or darkness to create day and night conditions.

5. Results

5.1 TEST TANK:

Within 30 minutes of being introduced into the tank, about three-fourths of the total of the bedbugs penetrated into the bottom of the fabric, with their outlines visible through the translucency of the fabric. Thereupon, they became stationary.

Most of the remaining bedbugs climbed the walls of the fabric (2" of fabric on side walls) and either became stationary on the sidewall surface (few) or penetrated into fabric at that point and became stationary.

However, six (6) bedbugs died within the first 30 minutes on the bottom (i.e., not sidewalls) portion of fabric that was treated with Kilspray.

On subsequent days, the cover was opened at least once per day and the bedbugs were disturbed using a dull-edged prong. It was ensured that the prong did not make direct contact with the bedbugs; rather, the bedbugs were disturbed by lightly tapping on the fabric, typically about one-quarter inch away from a bedbug location.

The bedbugs all showed movement to the extent observable, and additional deaths were not observed on days #2 and #3.

However, on Day 4, in the morning, approximately one-half (~25 out of original 50) of the bedbugs (including the six that died within the first 30 minutes) were found dead, all lying over the fabric on the bottom (i.e., not sidewalls) portion of fabric that was treated with Kilspray.

That is, during the preceding night, about 19 (25 – 6 previous) bedbugs emerged from out of the fabric and were found dead over the surface of the fabric where it was treated. Their death was confirmed by tapping the fabric near the bedbugs, and when no movement occurred, by gently moving them with the prong. No movement occurred and they remained in place thereafter.

No major changes were observed for the next five days, essentially the same 25 dead bedbugs were present on the fabric. However, on the morning of the 10th day of the test, all the bedbugs were found dead on the surface of the fabric where it was treated with Kilspray [i.e., over fabric on its bottom (not sidewall) portion]. As before, the bedbugs emerged out of the fabric and died over the surface of the fabric where it was treated. No bedbugs appeared to be present inside the fabric to the extent that can be determined.

In conclusion,

Day 1 – within 30 minutes of placing bedbugs into Test Tank with Kilspray: 6 dead

Days 2 and 3 – none dead

Day 4 – additional 19 dead

Days 5 to 9 – none dead to the extent determinable

Day 10 – all remaining dead to the extent determinable

Next 2 weeks – no further changes, all completely dead, confirmed by probing the fabric

A picture of the dead bedbugs, plus closeup, are included at the end of the report.

5.2 CONTROL TANK:

As in the case of the Test Tank, within 30 minutes of being introduced into the tank, about three-fourths of the total of the bedbugs penetrated into the bottom of the fabric, with their outlines visible through the translucency of the fabric. Thereupon, they became stationary. Most of the remaining bedbugs climbed the walls of the fabric (2" of fabric on side walls) and either became stationary on the sidewall surface (few) or penetrated into fabric at that point and became stationary.

Only about 2-3 dead bugs were observed.

On subsequent days, the cover was opened at least once per day and the bedbugs were disturbed using a dull-edged prong. It was ensured that the prong did not make direct contact with the bedbugs; rather, the bedbugs were disturbed by lightly tapping on the fabric, typically about one-quarter inch away from a bedbug location.

The bedbugs all showed movement to the extent observable, and no deaths were observed. Bedbugs essentially stayed within the fabric or on or inside sidewall fabric and remained stationary. Upon disturbing with the probe they showed normal, rapid movement.

At the end of the third week of the test, however, when the surface of the fabric was disturbed, innumerable (too many to count, could be as high as 50) newborn bedbugs were observed crawling on the surface of the fabric. These infant bedbugs appeared light gray in color, translucent, and about a millimeter in size. However, they did not grow in size during subsequent days to the extent determinable.

6. CONCLUSIONS AND RECOMMENDATIONS

It is our opinion that all the bedbugs dying in the Test Tank with Kilspray product within 10 days, compared to almost all the bedbugs remaining alive and active in the Control Tank during the same period (and in fact appearing to flourish with new births during the testing period) could only be attributable to the Kilspray product. The test conditions between the two tanks were otherwise identical, e.g., neither tanks were fed with food during the test period, same room conditions, etc..

[About 2-3 dead bedbugs were found in the Control Test. However, small amounts of mortality in control samples are not uncommon and do not detract from the overall conclusions above.]

The reason for the apparently episodic nature of the deaths is not known definitively. However, it may be due to the bedbugs emerging as a colony for feeding purposes at set intervals.

It is recommended that the test be repeated with following additional methods: In addition to repeating the test with the present setup of the tanks, we also recommend using shallower (flatter) tanks, with more surface area, to enable easier and more accountable capability for observing the bedbugs. The present setup provides folds, nooks, and crannies for the bedbugs to hide and become immobile, and the proposed additional shallow tray method will give them greater option for mobility. Thus, the effectiveness of the Kilspray product can be further studied under both configurations. Spraying Kilspray in the existing test tank is also another test that can be conducted, since in real world application the Kilspray is likely to be reapplied to the same fabric each time.

After conclusion of the above proposed re-testing, we recommend conducting a long-term study for the lifetime of the Kilspray material, by spraying a design amount of Kilspray only once and continuously replacing dead bedbugs until the material's effectiveness is reduced.

Finally, please note that within this controlled test, we (Korlipara Engineering) found and reported what we observed. No representations are made as to the effectiveness outside of the scope and conditions of the test.

