Field Evaluation of SenSci™ Volcano® Bed Bug Detectors and SenSci Activ® Bed Bug Lure In An Adult Shelter

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Summary

The SenSci Volcano Bed Bug Detector is a relatively new bed bug, *Cimex lectularius*, monitoring device that is unique from other bed bug monitors currently on the market due to its small footprint (7.5 cm by 7.5 cm) and patented lure (SenSci Activ Bed Bug Lure)(both sold by Bed Bug Central, Lawrenceville, NJ). We tested the effectiveness of the trap and lure in a substance abuse recovery home located in the Dallas, TX area. The site was a men's dormitory setting with a moderate infestation of bed bugs. We paired Volcano traps with lures against traps without lures under 24 beds. In addition, an un-baited ClimbUp® Insect Interceptor was placed at the foot of each monitored bed as a standard. A Chi-square test of equal proportions indicated that significantly more bed bugs were captured in Volcano units with SenSci Active lures ($\chi 2$ test, $P<0.05$).

Introduction

Cimex lectularius (L.) (Hemiptera, Cimicidae), also known as the common bed bug, is a blood-feeding parasite that lives on and around beds and is active principally at night. Bites from the bed bug may cause discomfort and itching, and their presence is considered highly undesirable by most people. Once established in a building, an infestation may spread among residents, traveling throughout dormitories and even among apartments. Bed bug infestations became rare in the mid to late 20th century primarily due to availability of effective insecticides such as DDT, Malathion and other insecticides; however with newer insecticides resistance to sprays has become widespread. Bed bug infestations are most common in multi-family housing, where a single introduction by a resident can spread throughout a building.

An essential tactic in management of bed bugs is early detection and effective monitoring of bed bug presence. Several methods are used to detect the presence of bedbugs. The most common method is a simple visual search of likely infestation sites. However, visual inspections are time-consuming and disruptive for residents. Visual inspections also fail to detect bed bugs in small infestations, or after treatment efforts have substantially reduced bed bug numbers. For this reason, passive and active (baited) bed bug traps have been developed in recent years. These traps can be left in place between pest control service calls and provide far more sensitive detection of bed bugs than human inspectors. Ways to improve the sensitivity and effectiveness of such traps have included searches for attractants that can be added to traps and continue to attract bed bugs over extended periods of time. One of the newest bedbug detection traps is called the SenSci Volcano Bed Bug Detector (made by Bed Bug Central, Lawrenceville, NJ. 877-411-1142). In addition, an optional lure is available for placing in the Volcano trap to increase its effectiveness. In this study we wanted to evaluate the effectiveness of Volcano traps

with and without lures, and compare both trap setups with the ClimbUp Bed Bug Interceptor, one of the most commonly used bed bug monitors in the pest control industry.

Methods and Materials

We tested the effectiveness of the traps and lure in a substance abuse recovery home/adult shelter located in the Dallas, TX area. The site was a men's dormitory with a moderate infestation of bed bugs. Beds were located in an open room with four rows of beds, each row subdivided by painted, concrete block walls, approximately 1.3 m high (Fig. 1). Bed bugs occurred naturally throughout all areas of the dorm room and could readily move among beds in the study area, due to the open floor plan. Twenty-four of the 30 beds in the dorm were selected for trap placement; six beds were not used due to difficulty in accessing trap sites or due to excessive clutter.

Baited and un-baited Volcano traps were randomly assigned to either the head or the foot of each bed on the side of the bed away from the concrete dividing wall. In addition, a ClimbUp trap was placed under the end of each bed next to the concrete dividing wall. A small piece of duct tape was used to secure each Volcano unit to the floor to minimize trap disturbance.

The ScenSci Volcano bedbug detection unit required a small amount of assembly and directions were included with the unit, the climb-up unit required no assembly and only required cleaning and a slight re-dusting of talcum powder during each service visit. Traps were checked, cleaned and re-dusted as needed every two weeks over a period of two months, between July 3 and Aug 28, 2015. During inspections, trap contents were emptied into a small cereal bowl, and adult and nymph bed bugs were counted. Flexible forceps, a hand lens, and a headlamp facilitated accurate counts.

Data were analyzed using SAS Statistical Software Vers. 9.2 for Windows (Proc FREQ) and the Data Analysis add-on for Excel Spreadsheet (t-test for paired samples, MicroSoft Office Professional Plus 2013). When conducting paired comparisons, beds with one or more missing traps were eliminated from the analysis.

Results

Over the two months of the study, SenSci Volcano Bed Bug Detector traps with SenSci Active lures caught more bed bugs than Volcano traps without lures or ClimbUp Interceptors (Table 1); however the chi-square test for equal proportions only indicated significant differences among trap catches for the 17 Jul sample date (χ^2=33.28, df=2, P=0.0009) and the 31 Jul sample date (χ^2=14.08, df=2, P=0.0001). Neither the 14 Aug (χ^2=1.07, df=2, P=0.58) or the 28 Aug samples (χ^2=2.11, df=2, P=0.35) showed significant differences in proportions of trapped bugs among treatments. The SenSci Active lure-baited traps caught more bed bugs than the ClimbUp Interceptor trap on 17 Jul; however when data from that date were compared directly, there was no significant difference in trap catches (t=1.37, df=21, P=0.185).

Table 1. Total numbers of bed bugs caught in three trap types. Homeless shelter, Dallas, TX. 2015.

	Numbers of bed bugs per trap type			
Date	ClimbUp Interceptor	Volcano with SenSci Active lure	Volcano without lure	Totals
17 Jul	157	207	105	469**
31 Jul	193	189	131	513**
14 Aug	76	66	65	207 NS
28 Aug	31	42	32	105 NS
	457	504	333	1294

** indicates dates with a significant departure from equal proportions, Chi-square test. P<0.01. NS indicates no significant departure from the hypothesis of equal proportions.

Due to missing data, sample sizes ranged from 18 to 23 beds over the four sampling dates. There was no significant difference between the number of bed bugs caught in the Climbup Interceptor traps compared to the baited Volcano traps over all dates (t-Test for paired samples, t=-1.32, df=82, P(T<=t) two tail = 0.19). There was, however, a significant difference in trap catches between baited and unbaited Volcano traps (t-Test for paired samples, t=3.82, df=82, P(T<=t) two-tail = 2.62E-04), with traps containing lures capturing an average of 67% more bed bugs than traps without lures.

Table 2. Average numbers of bed bugs per trap and sample sizes for Volcano bed bug detector traps with and without SenSci Active lures. Homeless shelter, Dallas, TX. 2015.

Date		Average number of bed bugs per trap		
	n	Volcano with SenSci Active lure	Volcano without lure	P (T<=t) for two-tailed samples
17 Jul	21	9.48	4.00	0.007**
31 Jul	23	8.04	5.70	0.011*
14 Aug	20	3.30	2.65	0.42 NS
28 Aug	18	2.33	0.94	0.11 NS

Overall trap loss rate during this study was 21/288 or approximately 7%. Five ClimbUp traps (5.2%) were missing throughout the study, vs 16 missing Volcano traps (8.3%) (NSD, χ^2=1.37E-04, df=1).

Discussion

SenSci Volcano traps with the SenSci Active lure caught significantly more bed bugs in this study than Volcano traps with no lure, especially during the first month of lure life. After four weeks, lure-baited traps caught numerically, but not statistically significant, more bed bugs than traps without lures. For maximum effectiveness, this data suggests that lures may need to be replaced as often as once a month. The Volcano trap with lure caught similar numbers of bed bugs compared to the ClimbUp Interceptor throughout the study. Interestingly, numbers of bed bugs in traps declined throughout the study (with the exception of ClimbUp trap numbers on 31 July). It is possible that consistent trapping with pitfall traps might contribute to the reduction of bed bug numbers in moderate to heavy infestations, though this idea would require further study.

The high turnover rate among residents in some adult shelters contributed to the loss of 21 pitfall traps over the course of the study. Departing or newly arrived residents often dislodged or discarded traps in their sleeping area, especially if they had not heard of the study or were unaware of why the traps are there. Despite being more discrete, the smaller size of the Volcano traps may have made them easier to lose amidst clutter and the personal belongings on the floor of this shelter. Nevertheless there was no statistical difference in loss rates between Volcano and ClimbUp traps in this study.

Trap use in adult shelters provides a useful tool for capturing and monitoring bed bugs. The SenSci Volcano Bed Bug Detector trap with lure trapped equivalent numbers of bed bugs compared to the ClimbUp Interceptor trap. The Volcano trap should be considered a useful monitoring tool for bed bugs in adult shelter settings.

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