*Study Report*

# Comparison of ChinChex and Cimexa Dust against the common Bed Bug

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January 2025

## Introduction

Silicon dust has demonstrated good performance in controlling various crawling insects. For example, CimeXa is a well-known insecticide dust used for bed bug control and is the most effective insecticide dust among the evaluated dust insecticides (Singh et al. 2016). However, its efficacy could be affected by manufacturing methods and environmental factors (Ranabhat and Wang 2020). ChinChex is a new inorganic insecticide dust product, containing amorphous silica as active ingredient. It has finer particles compared to CimeXa and is suspected to have greater efficacy against bed bugs. This study aims to confirm whether ChinChex has greater efficacy than CimeXa for controlling bed bugs.

## Materials and Methods

**Insecticide dusts.** CimeXa dust was purchased from a local vendor. ChinChex was provided by ChinChex company located in Hong Kong.

**Insects**. A field strain of bed bugs (New Brunswick) was used. The strain has been maintained in the laboratory since 2021 and has shown high resistance to deltamethrin based on previous studies in our lab. The bed bugs were fed blood 7-10 days prior to the experiment and kept in an incubator at 25 $^{o}$C and 12:12 L:D photoperiod.

**Dust Bioassay.** A 1-inch-band square (126.59 cm$^2$) was drawn on a brown cardboard sheet, which served as the treated area for this bioassay (Fig. 1). CimeXa and ChinChex were applied to this square using a fine brush according to the manufacturers' labels. The recommended concentration for CimeXa (2 oz/100 ft$^2$ = 56.7 g/92,903 cm$^2$) and ChinChex (100 mg/100 ft$^2$ = 0.1 g/92,903 cm$^2$) were weighed and evenly brushed onto the designated area (Table 1).

**Table 1.** Application rate of the treatments

| **Treatment** | **Manufacturer's label rate** | **Manufacturer's label rate (g/cm$^2$)** | **Application amount on 1-inch band area** |
|---|---|---|---|
| CimeXa | 2 ounces/100ft$^2$ | 0.0610 g/100 cm$^2$ | 0.0773 g (0.86 ml) |
| ChinChex1 | 100 mg/100ft$^2$ | 0.000108 g/100 cm$^2$ | 0.000136 g |
| ChinChex2 | 12,580 mg/100 ft$^2$<br>(126 x of label rate) | 0.0136 g/100 cm$^2$ | 0.0172 g (0.86 ml) |

The study was carried out during the first two hours of the dark period. A total of 25 male adult bed bugs and 25 nymphs were placed at the center of the square and confined with a plastic ring for 15 minutes. After this time, the confinement ring was removed to allow bed bugs disperse freely. The first 20 bed bugs that crossed the treated zone were collected into a clean petri dish. Additionally, the time for 20 bed bugs to cross the treated band was recorded. Control arenas were left untreated. Each treatment was replicated three times. Mortality was recorded daily for 7 days.

Due to higher density of ChinChex and the label rate is very low, we added a second test using approximately 127 times of the label rate, which equals to the volume of CimeXa based on the label rate for CimeXa.

## Results

**Bed bug crossing Time.** The average time for the first 20 bed bugs to cross the band for adults and nymphs was 158 and 123 seconds in the control, respectively. No significant avoidance behavior was observed by nymphs in ChinChex1, ChinChex2, and CimeXa treatments. However, adult bed bugs spent much longer time to cross ChinChex2 and CimeXa bands. An average of 695 and 385 seconds were spent by 20 adults to cross the CimeXa and ChinChex2 treated bands, respectively.

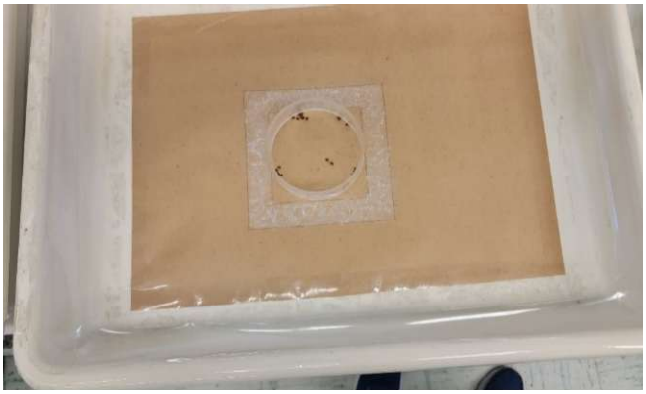
**Bed bug mortality.** Fig. 2 shows the adult mortality. By Day 7, the mortality in ChinChex1 reached only 50% due to very low amount of dust on the band. Both ChinChex2 and CimeXa caused 100% mortality to adult bed bugs at 7 day. Their speed of kill was similar. For nymphs, mortality at 7 day was 90% and 98% for CimeXa and ChinChex2, respectively. The speed of kill was similar.

## Discussion

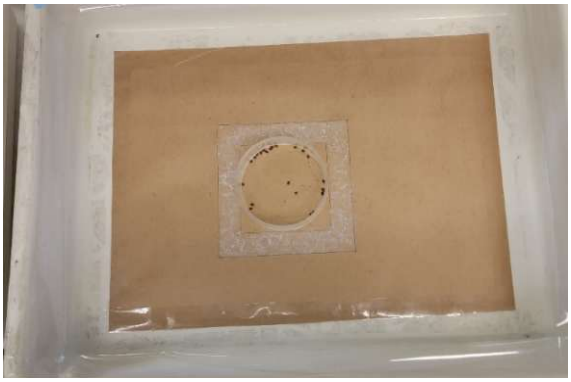
From our observations, both CimeXa and ChinChex2 caused similar symptoms in bed bugs. The insects were unable to move normally and appeared curled. When ChinChex was applied at the manufacturer label rate (ChinChex1), it could not cover the treated surface completely and caused low bed bug mortality. However, when the application rate of

ChinChex was increased 126 times (ChinChex2), mortality was 100% by Day 7. These results suggest that the label rate for ChinChex is too low. We recommend 12.6 g/100 $ft^2$ application rate for ChinChex.

A. Control



B. 0.07726g of CimeXa



C. 0.0172 g ChinChex (ChinChex 2)

**Fig. 1.** Experimental set up evaluating efficacy of silica gel dusts.

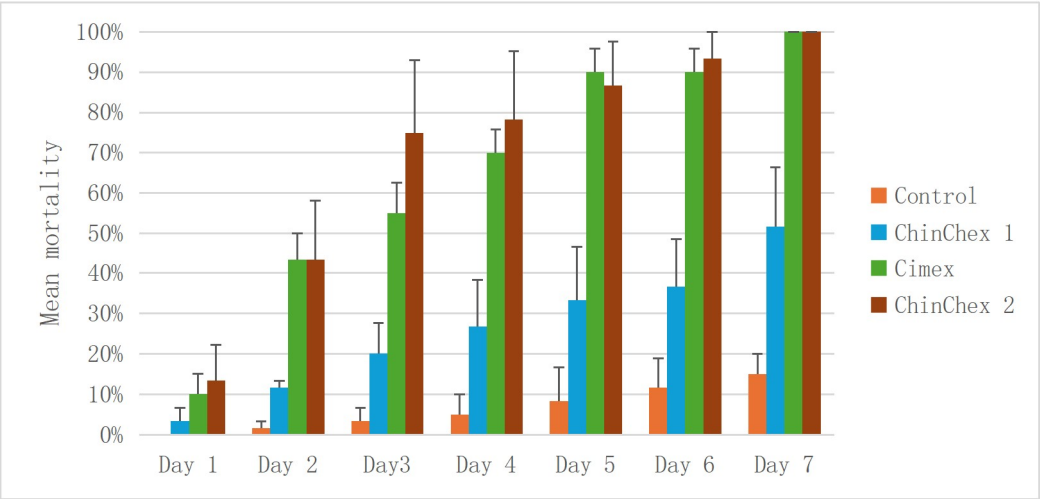



**Fig. 2.** Efficacy of ChinChex and CimeXa against a field strain bed bug adults.

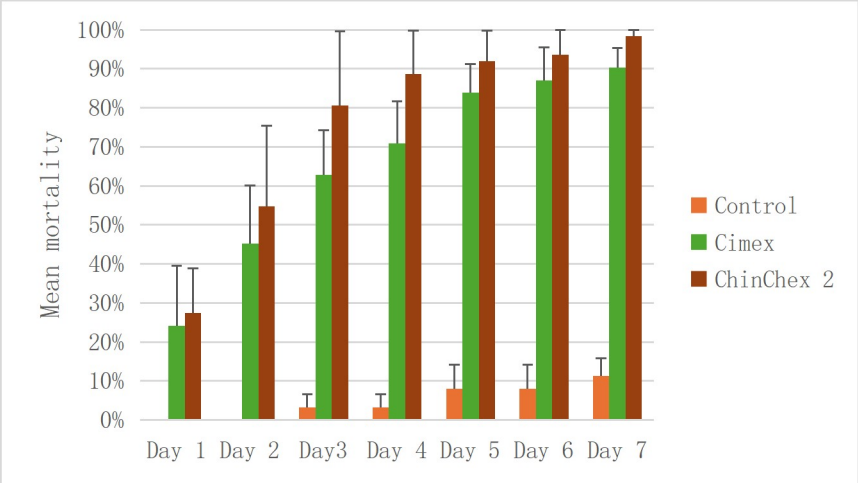



**Fig. 3.** Efficacy of ChinChex and CimeXa against a field strain bed bug nymphs.

## References

**Ranabhat, S., and C. Wang. 2020.** Effect of moisture on efficacy of selected insecticide dusts against the common bed bug, *Cimex lectularius* (Hemiptera: Cimicidae). Journal of Economic Entomology 113: 1933-1939.

**Singh, N., C. Wang, D. Wang, R. Cooper, and C. Zha. 2016.** Comparative efficacy of selected dust insecticides for controlling *Cimex lectularius* (Hemiptera: Cimicidae). Journal of Economic Entomology 109: 1819-1826.