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EFFECTIVENESS OF IMIDACLOPRID + BETACYFLUTHRIN TO CONTROL *CIMEX LECTULARIUS* (HEMIPTERA, CIMICIDAE)

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Abstract An experiment was conducted to evaluate the knockdown effect and effectiveness of imidacloprid 21% + betacyfluthrin 10.5% to control bed bug in laboratory conditions. During the experiment the temperature was ± 2 27°C, relative humidity 66% ± 5 and photoperiod of 12 hours. Imidacloprid 21% + betacyfluthrin 10.5% dilution was 2 ml per liter of water and applied at a flow rate of 50 ml/m^2 on the insects that were kept in containers of 500 ml with filter paper in the base to absorb the excess during application. For each treatment four replicates were used in a total of 28 specimens. Knockdown effect was evaluated after 10, 30, 60, 90, 180 and 360 minutes after application and mortality was evaluated at 24 and 48 hours after application. Knockdown results were 53.57% after 30 minutes, reaching a peak of 82.14% at 180 minutes, in mortality assessing the results reached 100% in 24 hours and remained 48 hours after application.
Key Words Bed bug; hematophagous insect, knockdown

INTRODUCTION

During the Middle Ages, the bed bugs use to infest houses that had better social conditions, due the warm these buildings, and these places had become appropriated for these insects. However with the progress and improvement of these buildings, infestations had become issues for all economic classes, (Gangloff-Kaufmann and Schultz, 2003). Until 1940 decades, the bed bugs were part of the daily in life of whole population, and its occurrence was common all around the world (Romero et al., 2007). This situation began to reverse from the 50s, due to improvements in health and social conditions of population, and especially the overuse of synthetic insecticides of residual effect of newly introduced as DDT (Dichloro-Diphenyl-Trichloroethane), because of that the bugs infestations had become rare especially in developed countries (Doggett et al., 2004). However, in economically disadvantaged countries, these occurrences were abundant (Boase, 2001).

In Brazil, through vector control campaigns, the infestations were indirectly controlled, and its occurrence was drastically reduced (Negromonte et al., 1991). For 40 years, the bed bugs infestation, remained stable, and these weren't considered serious nuisance to the Public Health (Doggett, 2005). Nearly 90s, in many parts of the world, professionals in pest control, reported a small increase in bed bugs infestations (Doggett et al., 2003). Over the years, infestations had become increasingly common, and early in 21st century, events have risen exponentially (Doggett, 2005). Now the reports of infestations increased throughout the world, mainly in Australia, United States and continental Europe (Doggett et al., 2004).

According to Boase, 2001, many hypotheses were raised by several authors, about the causes of resurgence and spread of infestation, but none were really rectified. Among these: The increasing of density on suburbs and the poor conditions there presented (Neves, 2005), an increase in trade used furniture (common practice in the United States and Europe), used by bedbugs as shelter (Szalanski et al., 2008), knowledge absence in part of the specific community or professional pest controllers on urban ecology and biology of these insects (Doggett et al., 2004), utilization of selective insecticides and insect-specific traps less toxic, among other, these way, the bed bugs could multiply without being noticed (Romero et al., 2007).

However, with growth population, increasing of international travels, poor social conditions in the outskirts of large cities are probably the most causes for their return (Maricon, 1999). Previously, the infestations were associated to poor hygiene and low socioeconomic class, but now the reports are independent of conditions of hygiene and economic class.

The Bad Bugs, as they are also called, are wingless insects, of reddish brown color, oval form, measuring 4.5 to 7 mm long, its body is flattened and adapted for hiding in crevices. Hematophagous insects of anthropophilic behavior (Vail, 2006). In the evening bite people, especially when they are asleep. Normally during the day, they stay hidden in crevices, furniture, cracks in the wall, piles of clothes, beds, between the seams of the mattress, almost any dark and protected place can become great home for these insects (Maricon, 1999).

According to the characteristics of *C. lectularius*, and the problems related to Public Health, was carried to verify the biological efficiency of Temprid ® SC (Imidacloprid 21.0% +betacyfluthrin 10.5%) to control bed bug in laboratory conditions.

MATERIALS AND METHODS

The test for the control of bed bug was held at the Center for Research and Innovation Bayer in Paulínia, São Paulo, Brazil in November 2010. The treatment used in the test, the dose of the active ingredients and commercial product per liter of water, the action mode, as well as concentration and formulation are shown in Table 1. The common and chemical name and commercial chemical group of the product used in the test are shown in Table 2. The product application was done with spray using a CO_2 pressure of 40 psi range with spout 8002 using a flow rate of 50 ml / m², on the insects that were kept in containers of 500 ml containing filter paper in the base to absorb excess during application. The infestation was performed right after application and evaporation of the insecticide spray at 27 ± 2°C and 66 ± 5% relative humidity.

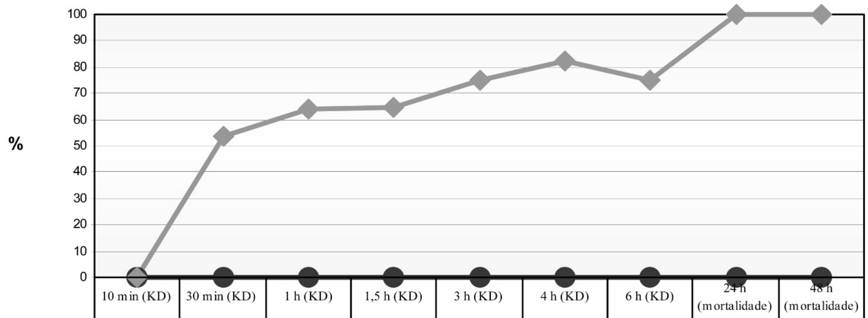
Were used for each treatment four replicates in a total of 28 individuals who were exposed to the treated surface for six hours. Knockdown was assessed with 10, 30, 60, 90, 180 and 360 minutes. After infestation, the bugs were removed and kept in contamination free containers and the estimated number of live and dead bugs 24 and 48 hours after exposure of the insects to treated surfaces.

Table 1. Treatment, trade name, dose, mode of action, concentration and formulation of the product used in the test.

Treatment	Active Ingredient	Dosage		Mode of Action	Concentration g/liter
		mg i.a./m²	ml p.c./L		
1.	—-	—-	—-	—-	—-
2.	Imidacloprid 21% + Betacyflutrhyn 10.5%	84 + 21	2	Contact	210 + 105

Table 2. Chemical product used in order to control bed bug.

Trade Name	Loto of Product	Common Name	Chemical Name	Chemical group
Temprid® SC	432-TX-1	Imidacloprid	1-[(6-chloro-3-pyridinyl) methyl]-N-nitro-2-imidazolidinimine	Neonicotinóides
		Betacyflutrin	Cyabo(4-fluoro-3-phenoxyphenyl)methyl 3-(2,2-dichloroethenyl) -2,2-dimethyl-cyclopropanecarboxylate	Pyrethroid



	10 min (KD)	30 min (KD)	1 h (KD)	1,5 h (KD)	3 h (KD)	4 h (KD)	6 h (KD)	24 h (mortalidade)	48 h (mortalidade)
Testemunha	0	0	0	0	0	0	0	0	0
Temprid® 2 ml p.c./litro	0	53.57	64.28	64.52	75	82.14	75	100	100

Figure 1. Percentage of knockdown (KD) and mortality with imidacloprid 21% + betacyfluthrin 10.5% in control of bed bug.

RESULTS AND DISCUSSION

In Figure 1 can be observed that the results were 53.7% of Knockdown in 30 minutes, reaching a peak with 82.14% of knockdown in 180 minutes. In mortality assessments, 100% were achieved in 24 hours and the result was kept for 48 hour exposure of the insects to treatment.

CONCLUSIONS

With the results obtained during the test can be concluded that: the untreated insects wasn't observed mortality therefore to validate the test; after applying Temprid ® SC (Imidacloprid 21% + betacyfluthrin 10.5%) wasn't observe spots formation or irritation to the operator at moment of application. Twenty-four hours after exposure of the bed bug treated whit Temprid ® SC (Imidacloprid 21% + betacyfluthrin 10.5%), mortality was 100%, extending this result to 48 hours. Therefore it is concluded that the Temprid ® SC (Imidacloprid 21% + betacyfluthrin 10.5%) at a dose of 2 ml/L, with a flow rate of 50 ml / m², can be recommended to control bed bug, according to the results of this work.

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