Journal of Biodiversity and Environmental Sciences (JBES)
ISSN: 2220-6663 (Print) 2222-3045 (Online)
Vol. 11, No. 4, p. 141-145, 2017
http://www.innspub.net

RESEARCH PAPER OPEN ACCESS

Commercially available insecticides effects on *Blatta orientalis* in Quetta city Baluchistan Province, Pakistan

Kashif Kamran*[1], Shahbuddin[1], Asim Iqbal[1], Muhammad Kamran Taj[2], Sana Arif[3]

1Department of Zoology, University of Balochistan, Quetta, Pakistan

2 Center for Advanced Studies in Vaccinology and Biotechnology, University of Balochistan, Quetta

3Department of Zoology, Sardar Bhadur Khan Women University, Balochsitan, Quetta, Pakistan

Article published on October 18, 2017

Key words: *Blatta orientalis*, Effective, Insecticides, Mortality

Abstract

Insecticide resistance in cockroaches is a serious problem as they are the main vector source of pathogenic bacteria. A total 180 of *Blatta orientalis* (oriental cockroaches) were collected from various localities in Quetta city and tested against 8 commercially available insecticides. Mortein power guard, Baygon insecticides were killed significantly faster and caused 100 % death in all cockroaches with direct contact within 10 minutes. Tar-o-mar and Icon 24 effectively controlled the cockroaches causing 80% reduction in population. Finis (20%), Good Bye (10%) and Roach killer insecticides showed 0%mortality. Thus, we propose that Mortein power guard, Baygon could be valuable insecticides to be used in integrated resistance management of oriental cockroaches.

***Corresponding Author:** Kashif Kamran ✉ kashifkamran944@gmail.com

Introduction

Blatta orientalis, water bug cockroaches control strategies are difficult to achieve due to their resistant ability against certain insecticides. Cockroach belongs to the order Blattodea having more than 5,000 species (Beccaloni and Eggleton, 2013). Only 50 species of cockroaches have been so far reported living in or around human living structures (Kinfu and Erko, 2008). Cockroaches are considered as serious household and public health pest in worldwide (Pai *et al,* 2004). It shows physical resembles with a type of beetle named *Aeolesthes sarta* Solsky (Kamran *et al*., 2017).

Cockroaches can spread diseases such as diarrheal diseases, amebic dysentery, cholera, leprosy, plague, typhoid fever including viral diseases such as poliomyelitis. Therefore, they might be important in transmission of nosocomial infections (Sarwar, 2005). Cockroaches are although considered as harmful, besides they can also play important role in balancing environment. Cockroaches are responsible for breaking macrobiotic matter in to simplest form. They are significantly important pest because they carry and transfer soil microbes on their different body parts.

Control of cockroaches is very difficult to achieve; as they are good runner and can hide from direct contact of insecticides. Insecticides like organ chlorine and organophosphate insecticides, carbamate and pyrethriods compounds show good results in controlling of cockroaches. Resistance has become a substantial problem which sometimes causes complete failure of chemical control operations in many countries (Diaz *et al.,* 1994). The objective of this study was to evaluate the effectiveness of commercially available insecticides with their cost purchase against *Blatta orientalis* cockroaches.

Material and methods

Sampling sites

The study was conducted in Quetta City during April to July 2017 in two different localities. Coordinates for both locations in Quetta city were 30°12'27.5"N, 66°59'54.3" E near Jail road Hudda and 30°11'43.7" N, 67°12'3.4"E near Thoghi road through using android operating system based X-location application. A total of 180 adult samples of female *Blatta orientalis* cockroaches were collected by direct hand picking method (Le Pelley, 1935).

Glass jars method

Cockroaches were reared in glass jar (surface area=200 cm^2) with consistent supply of 25±3°C temperature, 70±2% relative humidity and provision of a bread piece. Identification of collected cockroaches was done using available keys in literature. The glass jars were autoclaved and dried in incubator for about 1 hour. Athin layer of butter was then applied inside it in order to prevent outside movement of cockroaches. The specimens were transferred to Entomology laboratory, Department of Zoology at University of Baluchistan, Quetta to check insecticides efficacy.

Insecticide spray

Six insecticide treatment strategies that included one control treatment under laboratory conditions having specific concentrations were transferred in the glass jars and covered with holding caps (table 1). Icon 24 WP, 5% EC was dissolved in the acetone using magnetic stirrer in 7.5mg/100mL ratio and pipette out its 1ml. Other insecticides labeled with ready to use such as Baygon, Finis, Motrin, and Tar-O-Mar were directly applied. Good Bye having 10gm was dissolved in 50ml water. Roach Killer was prepared with homemade ingredientincluded3-teaspoons of boric acid, sugar and water mixed in equal amount. This insecticide was not purchased as it can easily be prepared at homes.

Surf Excel detergent was mixed in 10 ml of water and used its 2ml in each glass jar. All chemicals were filled 1ml (1cc) syringes and injected in the glass jar. The glass jar then rolled on flat surface to maintain uniform distribution of insecticide to achieve best results. The choice of these insecticides was made because of their availability in local supermarkets and most frequent use in houses. All chemical were purchased from local shops and markets of Quetta city.

Population reduction in cockroaches was calculated by late night visual inspection and using the formula (Agrawal *et al.,* 2005) after 10 minutes of treatments:

$$\% \text{ reduction in population density} = \frac{\text{Pre} - \text{counting density} - \text{Post} - \text{counting desity}}{\text{Pre} - \text{Counting desnity}}$$

Table 1. Insecticides; chemical composition, relative group and specific dose used against the *Blatta orientalis* cockroaches.

Trade name	Chemical composition	Group	Dose
Motrin	Allethrin 2.09 g/kg and Resmethrin 0.39 g/kg	Pyrethroids	1mL
Tar-O-Mar	Tetramethrin, D-Allethrin, polarized Born-Oppenheimer (PBO), perfume, solvents and Propellants (400ml)	Organophosphorus-chlorpyrifos	1mL
Baygon	Tetramethrin 0.3 %, Cyprermethrin 0.15 %, D-Allethrin 0.10%	Carbamates	1mL
Icon 24 WP*	Lambda-cyhalothrin (250gm/Kg)	Cyhalothrin	0.5mg/L
Finis	Rich-d-trans Allethrin 0.1%, Cyprermethrin 0.075%, Tetramethrin 0.1%, Citronella, perfume and solvents 99.72%	Mixed group	1ml
Good Bye*	Permethrin (0.5% w/w)	Permethrin	5gm/L
Surf Excel*	Surfactant, enzyme, builder, fuller, polycarboxylates and optical brightener	Detergent	2ml
Roach Killer**	Boric acid, sugar, water (6gm)	Mixed group	1mL

*indicate insecticides available in powder form and diluted in water and acetone.

** indicates Roach Killer is the only selected insecticide based on homemade ingredient.

Results and discussion

Blatta orientalis female were observed dark brown and black in coloured with prominent ovipositor (Fig. 1). Insecticides practices conducted in this study showed 70% effectiveness of Good Bye gel against *Blatta orientalis*. Mortein power guard and Baygonaerosol sprays were the most effective showed 100% mortality rate among the others selected insecticides. This result further confirmed that the mode of action of both of these insecticides is unique due to chemical composition.

Fig. 1. Female *Blatta orientalis* cockroaches collected from different localities of Quetta city.

During this course of research, it was noted that Surf Excel solution works as temporary repellent and was reported as the least effective treatment due to lack of its killing habit. Other insecticides showed 20% Finis, 10% Good Bye and 0% Roach Killer reduction in population density of *Blatta orientalis* cockroaches respectively. Post treated cockroach density in the treatments and control units are presented in Fig. 2. Although, Mortein and Baygon insecticides were the *most expensive insecticides sprays* but showed high rate of mortality. While, other insecticides had low priced and also showed low tendency in order to control the cockroaches (table 2).

Table 2. Detail of insecticides, manufacturing companies and purchasing price.

Trade name	Companies	Price /item
Motrin (Ready to use)	Reckitt Benckiser Ltd, UK	350
Tar-O-Mar	Isfahan, Iran	150
Baygon (Ready to use)	SC Johnson & Sons Ltd, USA	450
Icon 24 WP, 5% EC	Zeneca Ltd, UK	250
Finis	SC Johnson & Sons Ltd Pakistan	35
Good Bye	Good Bye chemical company Ltd, Pakistan	80
Surf Excel	Unilever Ltd, Pakistan	70
Roach Killer	Homemade	30

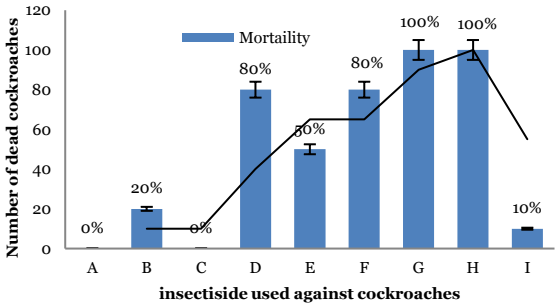

Fig. 2. Percentage reduction/mortality rate of *Blatta orientalis* on insecticides: a. Control, b. Finis, c. Roach Killer, d. Tar-O-Mar, e. surf excel, f. Icon 24 WP, g. Mortein power guard, h. Baygon, i. Good bye.

In certain studies, it was revealed that best results can be obtained in hospital rooms sprayed with insecticides from groups of pyrethroids and carbamates. Further, high dose chemicals can reduce the immunity and additional complications in sick people in spray areas (Owens, 2002; Larson *et al*., 2012). In addition, improving sanitation and the structural integrity of houses also contribute to effective control of cockroach infestations (MacDonald *et al*., 1987) by removing available food, water and harbourages. Chemical failure to reduce oriental cockroach population highlights their ability of resistance.

Fumigant toxicity and direct contact of insecticides are found to be the most effective and rapid methods applied against cockroaches (Ngoh *et al.,* 1998). Cockroach infestations have been indicated as a major contributor to asthma throughout the world. Eradication of cockroaches from schools, homes and public buildings required long-term processes and proper management (Eggleston and Arruda, 2001).

Conclusion

Insecticides although provide temporary relief and subsequently cause allergic reaction to skin and eyes. Proper selection of insecticide can help in eradication of cockroaches from houses as they show high level resistance against numerous insecticides. In conclusion, it recommends Baygon and Motrin insecticides to be used for effective control against *Blatta orientalis* cockroaches.

Acknowledgements

The authors would like to express their sincere gratitude to Dr. Muhammad Ashfaq Ahmed and Muhammad Kamran Taj for her personal efforts in finalizing this manuscript.

References

Agrawal VK, Tilak R, Gupta KD. 2005. Efficacy of synthetic pyrethroid and propoxuraerosol in the control of German cockroaches (Dictyoptera: Blatellidae) in cookhouses. Journal of vector borne diseases **42(3),** 117.

Arif S, Taj MK, Kamran K, Iqbal A, Taj I, Mohammad G, Hussain K, Ahmed A. 2017. Household cockroaches of Quetta city as reservoir for infectious pathogenic bacteria.Journal of Entomology and Zoology Studies **5(1)**, 649-653.

Beccaloni G, Eggleton P. 2013. Order Blattodea. In: Zhang, Z.-Q.(Ed.) Animal Biodiversity: An Outline of Higher-level Classification and Survey of Taxonomic Richness (Addenda). Zootaxa **3703(1),** 46-48.

Diaz C, Bisset JA, Gonzalez T, Rodriguez MM. 1994. Resistance to organophosphate, carbamate and pyrethroid insecticides in *Blatella germanica* (Dictyoptera: Blattellidae) in two municipalities of the city of Havana. *Revista Cubana* De Medicina Tropical journal **46,**130–2.

Eggleston PA, Arruda LK. 2001. 6Ecology and elimination of cockroaches and allergens in the home. Journal of Allergy and Clinical Immunology **107(3)**, S422-S429.

Kamran K, Kakar A, Arif S, Iqbal A. 2017. Evaluation of insect repellent and insecticide implantation techniques against *Aeolesthes sarta* Solsky in Quetta district of Baluchistan province. Pakistan. Journal of Entomology and Zoology Studies **5(2)**, 273-276.

Kinfu A, Erko B. 2008. Cockroaches as carriers of human intestinal parasites in two localities in Ethiopia. Transactions of the Royal Society of Tropical Medicine and Hygiene **102(11),** 1143-1147.

Le Pelley RH. 1935. The Common coffee mealy bug of Kenya (Hemiptera: Coccidae). Stylops **4,** 185-188.

Lee DK, Lee WJ, Sim JK. 2003. Population densities of cockroaches from human dwellings in urban areas in the Republic of Korea. Journal of Vector Ecology **28(1),** 90–6.

Ngoh SP, Choo LE, Pang FY, Huang Y, Kini MR, Ho SH. 1998. Insecticidal and repellent properties of nine volatile constituents of essential oils against the American cockroach, *Periplaneta americana* (L.). Pest Management Science **54(3)**, 261-268.

Pai HH, Chen WC, Peng CF. 2004. Cockroaches as potential vectors of nosocomial infections. Infection Control & Hospital Epidemiology **25(11),** 979-984.

Sarwar M. 2005. Insect Vectors Involving in Mechanical Transmission of Human Pathogens for Serious Diseases. International Journal of Bioinformatics and Biomedical Engineering **1(3),** 300-306.