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Chemical Pesticides Used Against Urban Pests in Kohgiluyeh and Boyer-Ahmad Province: A Descriptive Cross-Sectional Study

Mehdi Miri[1], Mohsen Fakhraie[1], Mehrdad Garmsirinejad[2], Pouria Feizabadi[3], Niayesh Motazedi[4], Fateme Khodabakhshi[4], Mohadese Shahrokh[5], Aboozar Soltani[6*]

[1] Student Research Committee, Department of Biology and Control of Disease Vectors, School of Health, Shiraz University of Medical Sciences, Shiraz, Iran
[2] Student Research Committee, Department of Public Health, School of Health, Shiraz University of Medical Sciences, Shiraz, Iran.
[3] Student Research Committee, Department of Epidemiology, Iran University of Medical Sciences, Tehran, Iran
[4] Student Research Committee, Department of Environmental Health Engineering, School of Health, Shiraz University of Medical Sciences, Shiraz, Iran
[5] Student Research Committee, Department of Occupational Health and Safety Engineering, School of Health, Shiraz University of Medical Sciences, Shiraz, Iran
[6] Research Center for Health Sciences, Institute of Health, Department of Medical Entomology and Vector Control, School of Health, Shiraz University of Medical Sciences, Shiraz, Iran

*** Corresponding author email: Abu2sol@yahoo.com**
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Abstract

Urban pests, including cockroaches, flies, mosquitoes, termites, arachnids, and rodents, can adversely affect human life. They pose health risks by transmitting infectious diseases, psychological risks by causing discomfort, fear, and anxiety, and economic losses through property damage and pest control costs. Chemical pesticides remain one of the most widely applied management strategies. Due to the potential health and environmental risks associated with pesticide misuse, targeted and informed application of these chemicals is essential. This study aims to identify the most commonly used pesticides for urban pest control in Kohgiluyeh and Boyer-Ahmad Province.

This descriptive cross-sectional study was conducted in 2024 in the cities of Yasuj, Dehdasht, Gachsaran, Dena, Choram, Basht, and Landeh. Structured checklists were completed by pesticide sellers in 60 stores, selected from a list provided by the Agricultural Organization using an availability sampling method. Data were analyzed using SPSS version 18, where frequencies and percentages were calculated for qualitative variables, and means and standard deviations were reported for quantitative variables.

The results showed that pesticides with various formulations, such as powders, sprays, aerosols, and poisoned baits, were reported from several chemical groups, with pyrethroids having the largest share (53%). At the compound level, cypermethrin (34%), tetramethrin (31%) and chlorpyrifos (30%) were the most sold and used, while acetamiprid had the lowest usage (3%).

Pyrethroids were the most widely used pesticides in Kohgiluyeh and Boyer-Ahmad Province, likely due to their lower toxicity, affordability, and availability compared to other classes. While pesticides remain the primary method of urban pest control in the region, their excessive or improper usage may pose health risks, especially for vulnerable groups, and contribute to pest resistance. Accordingly, training programs for pesticide vendors, pest control companies, and the public are recommended to promote safe and targeted application.

Keywords: Pesticide Vendors, Pest Control, Pyrethroids, Insecticides, Urban Pests

Introduction

Arthropods, as the most abundant organisms on Earth, are widely distributed across all regions except the North and South Poles (1-3). Certain arthropods have adapted to human habitats due to their synanthropic behavior and rapid reproductive cycles. Urban pests refer to a variety of organisms that commonly inhabit human residential and commercial environments. These include insects (e.g., houseflies, cockroaches, mosquitoes, bedbugs, lice, ants, termites), arachnids (e.g., spiders and scorpions), reptiles (e.g., lizards), and rodents (e.g., house mice) (4-7). The presence of urban pests in residential environments and places used by humans, such as restaurants, hotels, food storage, and water sources, is always considered one of the most important health challenges. In addition to biting and causing harassment to humans, these creatures can also play a role in transmitting important diseases to humans in various ways. Besides the health problem, the presence of these creatures in these environments is frightening for many people and disrupts their mental peace (6, 8-10).

Humans have always been fighting these creatures to keep themselves and their facilities safe and have been trying to control and eradicate these pests from their living environment with various methods, including physical, biological, mechanical, and chemical control methods, which chemical control plays the most important role among them. The basis of chemical control is synthetic pesticides that are used in different groups and formulations against pests. Chemical pesticides are divided into different groups based on their structure, including organochlorines, organophosphates, carbamates, pyrethroids, phenyl pyrazoles, neonicotinoids, and so on, and based on the target organisms, they are divided into groups such as insecticides, acaricides, and rodenticides. In a more detailed classification based on the pests in question, these chemicals are specifically known to have an effect on one or more specific pests and are classified into groups such as cockroach killers, mosquito killers, ant killers, reptile killers, bedbug killers (7, 11-17).

The use of various pesticides in different parts of Iran is influenced by factors such as the abundance of urban pests, the number of residents and residential areas, weather conditions, and the amount of agriculture (18, 19). Kohgiluyeh and Boyer-Ahmad Province is one of the southern provinces of Iran, which is among the small provinces in terms of area and population; however, the level of agriculture and the presence of various species of arthropods, especially urban pests, in this province are significant (17, 20). Due to the potential health and environmental risks associated with pesticide misuse, targeted and informed application of these chemicals is essential. This study aims to identify the most commonly used pesticides for urban pest control in Kohgiluyeh and Boyer-Ahmad Province.

Materials and Methods

This cross-sectional study was conducted in Kohgiluyeh and Boyer-Ahmad province; this province has an area of about 16260 square kilometers and is neighboring with Isfahan and Fars provinces to the east, Bushehr province to the south, Khuzestan province to the west, and Chaharmahal and Bakhtiari province to the north. The cities of this province, which include Yasuj as the provincial capital, Dehdasht, Gachsaran, Dena, Choram, Basht, and Landeh were selected as study areas

Table 1, Structured checklist were distributed to pesticide vendors across 60 registered stores, as listed by the Agricultural Organization, in the selected cities according to the statistics of the Agricultural Organization; All interviews and data collection procedures were conducted by a trained entomologist to ensure accuracy and consistency (20, 21).

Table 1. Geographic coordinates of the cities studied

City	Longitude	Latitude
Yasuj	51.59905664598673	30.65851396138691
Dehdasht	50.563680526360976	30.792837280609938
Gachsaran	50.8057717071885	30.35146618685573
Dena	51.4581270246086	30.860591841758243
Choram	50.741405315397785	30.7509957724247
Basht	51.15540034552951	30.359687255491735
Lendeh	50.42452563217616	30.97716407613258

The checklist designed for this study consisted of two main parts; the first part included questions about demographic information such as age, gender, and work experience of pesticide sellers, and the second part included questions about pesticides, their formulations, and sales volume. The checklist's validity and reliability were established through previous studies in a similar context. Data analysis was performed utilizing SPSS version 18 software. To report qualitative variables, frequencies and percentages were reported, and for quantitative variables, means and standard deviations were reported.

Results

Based on the results obtained, out of 60 pesticide sellers, 47 (78.3%) were men and 13 (21.7%) were women. The average age of the participants was 33.02 ± 5.28 years, and their mean work experience was 10 ± 2.03 years. Demographic information of pesticide sellers is presented in Table 2. Various commercial pesticide products such as Hacker, Ghahraman, Faraz, Kafi, and others, are available in multiple formulations, including solutions, poisoned baits, powders, aerosols, and sprays. The active ingredients in these products were analyzed to identify the chemical groups present. The analyzed pesticides belonged to several major insecticide classes, including pyrethroids, organophosphates, phenylpyrazoles, and carbamates, with varying prevalence. Pyrethroids accounted for the highest share among the pesticide groups, while carbamates had the lowest representation Figure 1.

Table 2. Demographic information of pesticide sellers

Age (Mean±SD)		33.02±5.28
Work Experience (Mean±SD)		10±2.03
Gender	**Male**	47 (78.33%)
	Female	13 (21.67%)

Among the identified compounds, permethrin and deltamethrin, both pyrethroids, were the most commonly used, whereas acetamiprid, a neonicotinoid, was the least frequent. Many formulations combined pyrethroids such as permethrin and cypermethrin with insecticides from other classes to enhance efficacy or broaden the spectrum of control. In addition to insecticides, rodenticides such as warfarin, bromadiolone, and brodifacoum were also widely used. Furthermore, reptile-repellent formulations such as “Sulfac” (containing cyfluthrin) were

reported in this province by both professional pest control companies and household users. The distribution of different pesticide types and their frequency of use is shown in Figure 2.

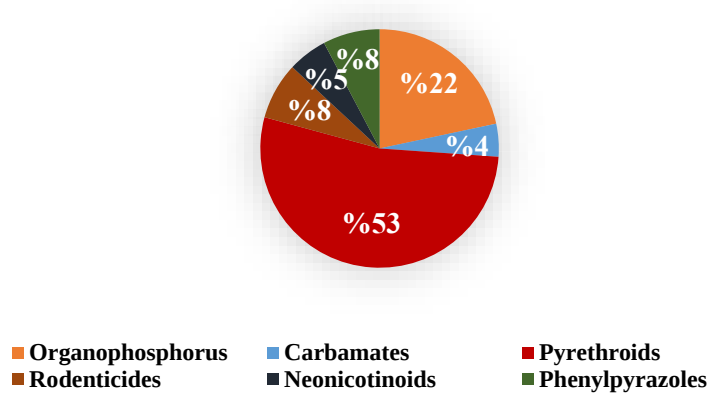

Figure 1. Percentage of different pesticide groups

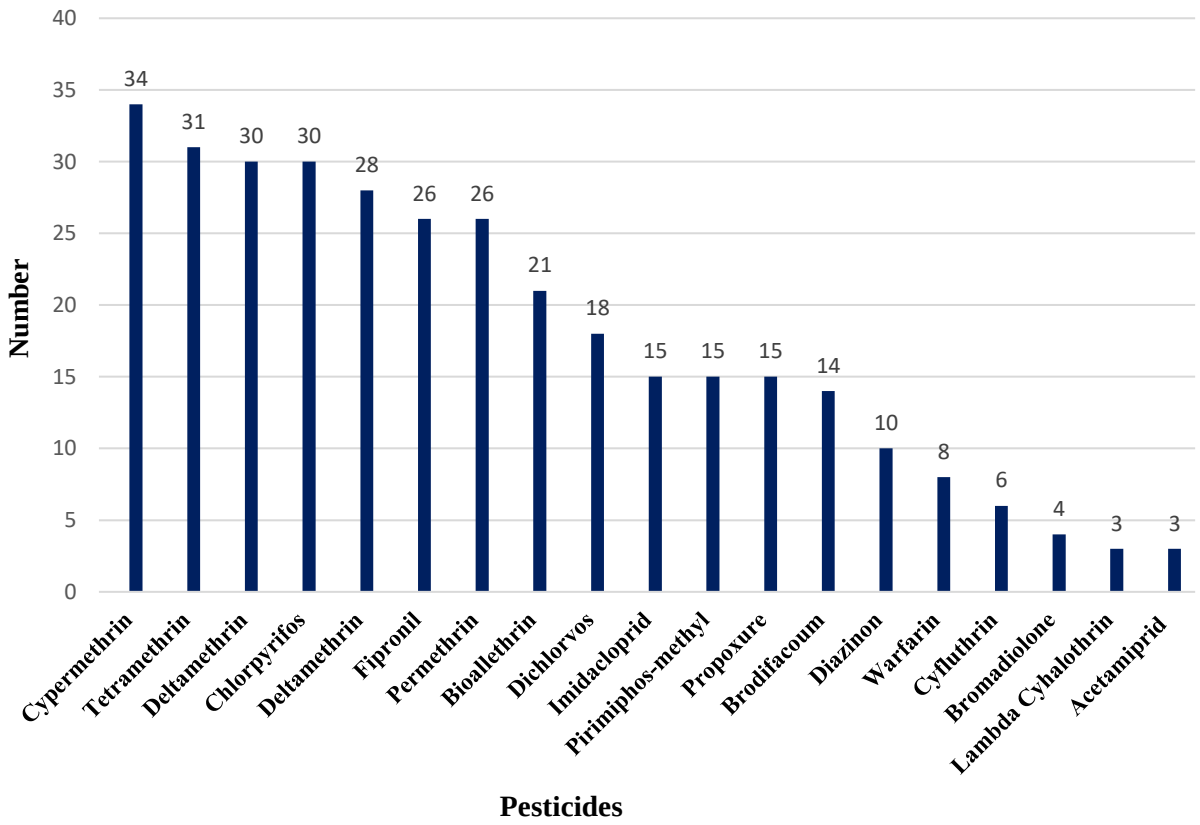

Figure 2. Frequency of best-selling pesticides in Kohgiluyeh and Boyer-Ahmad Province

Discussion

According to the findings of this study, chemical pesticides play a central role in urban pest management in areas such as Kohgiluyeh and Boyer-Ahmad Province. Among the pesticide groups, pyrethroids are widely used due to their relatively low toxicity to humans and proven efficacy. This finding aligns with a study by Pentamwa et al., which investigated indoor pesticide use in Bangkok, Thailand. They reported that pyrethroids constituted the majority of pesticides used in residential settings (22).

The socioeconomic status is another factor influencing pesticide usage patterns. Given that Kohgiluyeh and Boyer-Ahmad is considered an economically underdeveloped province, the high use of low-cost chemical pesticides is not surprising. Vaezafshar et al. conducted a study in 2024 to investigate the widespread prevalence of pesticides in low-income housing in Canada; the results of the study showed that in low-income homes, the level of pesticide use was high for several reasons and pesticides such as Pyrethrin and Permethrin were used very frequently and other pesticides from the organophosphates and neonicotinoid groups were also used to control pests, which are very similar to the results of our study (23).

Julien et al. conducted a study in the United States to investigate the presence of various pesticides in residential homes; the results of this study showed that the pesticides Permethrin and chlorpyrifos were used in all the homes studied and the pesticides diazinon, cypermethrin and cyfluthrin were also used on average in more than 85% of the homes. The amount of use of Permethrin and chlorpyrifos pesticides reported in this study was consistent with the results of the cities studied, but other widely used pesticides reported differed significantly from the results of the present study(24).

Nalwanga and colleagues also conducted a study to investigate the knowledge and practices surrounding the use of various pesticides in residential homes in Uganda. The findings of this study were largely consistent with those of the present study; after analyzing the data collected through a questionnaire, the results indicated that pesticides are regarded as the most important tool for the prevention, control, and elimination of urban pests. Among the pesticides used, diazinon was common and had a significant effect on bed bugs. Additionally, in all spray formulations, which had the highest frequency of use, pyrethroid pesticides, including deltamethrin, permethrin, and pyrethrin were employed.

Due to its high toxicity and significant biological risks, the use of diazinon has been banned or severely restricted in many countries. Therefore, unlike the study conducted in Uganda, in the present study, the sale and consequently the use of this organophosphate pesticide have decreased markedly.

Organophosphates and pyrethroid pesticides have a high consumption rate in the studied cities. Among them, pesticides such as Cypermethrin, Tetramethrin, Chlorpyrifos, and Permethrin are significantly used for urban pest control. These results are also consistent with the study by Hung et al. in Taiwan; in this study, which also investigated the presence of various pesticides in house dust, the mentioned pesticides, especially Cypermethrin and Chlorpyrifos, were present in most of the indoor dust samples (25). Future studies should incorporate environmental and biological monitoring to assess pesticide residues in soil, water, and indoor environments, as well as potential human exposure. Longitudinal studies could also help identify temporal trends in pesticide use and resistance patterns among urban pests. Moreover, educational interventions for vendors and the public should be designed and evaluated to promote safe handling and targeted application of pesticides. Expanding research to neighboring provinces would provide a broader regional perspective and allow for comparisons across different socioeconomic and ecological settings.

Conclusions

The findings of this study emphasize the importance of pesticides, especially pyrethroids, in Kohgiluyeh and Boyer-Ahmad Province. Pyrethroids are likely more popular among consumers because they are less toxic and hazardous to humans compared to other pesticides, more readily biodegradable, less persistent in the environment, less odorous particularly in comparison to organophosphates and are more affordable and accessible.

Although various pest management strategies are available, chemical pesticides remain the predominant method in this region. Despite their effectiveness in controlling and eliminating pests, it is important to note that excessive or improper use of these chemicals can cause serious health risks, particularly for vulnerable groups such as children, pregnant women, and the elderly. Moreover, inappropriate application increases the likelihood of resistance development in urban pests, leading to significant environmental and economic consequences. Therefore, providing accurate training and information to pesticide vendors, spraying companies, and the general public is essential to ensure the appropriate and targeted use of these chemicals.

Conflicts of interest

The authors report that there are no competing interests to declare.

Data Availability Statement

The data used to support the findings of this study are available from the corresponding author upon request.

Ethical approval and consent to participate

This study was approved by the Shiraz University of Medical Sciences ethic committee (IR.SUMS.REC.1403.330).

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