

Study of *Dentilla* sp. "Hymenoptera: Mutillidae", Velvet Ants Habitats in the Center of Iran

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ABSTRACT

Dentilla velvet ant is a venomous insect of Iran that has different species. It has been reported from different parts of the country and is responsible for stings in infested places of residential homes. Regarding the importance of these bites and because identifying the ant's habitats is very important in planning to control it, this study was done to identify its habitats in Kashan City, Central of Iran. This study was done in a descriptive method. Velvet ant was sampled from 45 homes in Kashan by census method. The presence of velvet ant was confirmed in all 45 infested homes. Sampling was performed 16 times at sunset and early evening in the spring and summer. After the diagnosis of infestation, activity places of this ant were examined.

Three hundred thirty four velvet ants were collected from 45 infested homes and carpentry workshops. Infested places in homes included a courtyard, besides the courtyard wall, in the gap between the mosaics, the sides of the garden walls, inside the living room under carpets and rugs. The activity of this ant in the bedrooms and living rooms from May to September was higher than in other months. The average number of caught velvet ant in each sampling was 7.1. In residential areas, the most activity of velvet ant was observed inside the panel of the walls. It seems that warm weather in Kashan has caused the abundance of velvet ants, and as a result entrance to the private living places of humans.

Keywords: Velvet ant, Mutillidae, Ecology, Habitat, Iran.

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INTRODUCTION

Iran, like the rest of the Middle East, is appropriate for living venomous animals such as snakes, scorpions, and other biting and hematophagous arthropods [1, 2]. Snakes in addition to cause poisoning may lead to microbial infection of the injured [3, 4]. Among venomous animals, scorpions are more important in terms of spread and frequency of stings. Each year, many people in Iran are stung by them; some of them lead to death. Deadly scorpion stings have a variety of complications,

including bleeding and nervous symptoms in injured people [5-9].

Among insects, wasps and bees to be included as venomous animals in Iran. Venomous wasps and bees belong to the Hymenoptera order, which has activity in all warm and temperate regions of the world and in urban and rural areas to be considered as stinging agents. Their sting can be a local pain to systemic side effects such as swelling, breathing and kidney problems, decrease of blood pressure, and occasionally cause death, which has been reported in susceptible individuals [10-13].

The exact number of deaths due to bee sting in the world is not available but in some countries such as the United States between 1802 to 1997, about 28.2 percent of the death rate due to stings of venomous animals were attributed to wasps and bees [14]. Four families of Hymenoptera such as Vespidae, Apidae, Mutillidae, and Formicidae are able to sting and defend the nest and their biological realm. *Vespula vulgaris*, *Vespula germanica*, *Vespula pensylvanica*, *Vespa orientalis*, *Vespa carbro*, and wasp species are examples of stinging bees when their nest is targeted to manipulating or destroying, they find the aggressive spirit and attack humans or animals. Bees and wasps more use their sting to defend the colony. When a wasp or bee stings a person, venom enters the body through the sting and the person suffers from complications that have both local and systemic symptoms [15, 16]. Among the four families of stinger bees, wasps, and ants, the family members of Mutillidae or velvet ants are not offensive and their defense and sting to the injured take place individually. This family is famous for painful sting or killing cow, but death due to their sting has not been reported yet. Some mutillid wasps are parasitoids immature stages of insects, including other wasps [17, 18]. Their sting is like the other bees, people who have an allergy to the sting may show too much reaction to it, so as a result should be avoided to encounter and contact and sting. Treatment of sting is like any ordinary sting, velvet ant stings are usually for defense [19, 20].

All Mutillids are single wasps that attack mostly larvae, pupae, or matures of Hymenoptera. However, in some cases, the velvet ant targets larval stages of beetles, moths, and cockroaches with its non-nutritional. Mutillids are not a real threat to humans, livestock, or pets. LD50 venom of velvet ants is 71 milligrams per kilogram of body weight for the mouse that is relatively non-toxic and low risk compared with *Pogonomyrmex* ant (a genus of harvester ants, occurring primarily in the deserts of North, Central, and South America), which is equivalent to 0.12 and in some bees 2.8 mg/kg [21, 22]. Mutillidae family includes about 230 genera and about 8,000 species that are scattered around the world [23-25]. In some

sources, it has been reported that the number of species and genera of this family is 4200 and 208, respectively and the number of species is estimated to reach 6,000 [26].

In Iran, 67 species in 21 genera have been identified. These species have been collected from different provinces of the country, including Ilam, and West and East Azerbaijan [27, 28]. Fear of animals including insects and other arthropods is important because of being toxic and likely to bite or sting humans [29, 30]. Velvet ants with *Dentilla* genus are considered recently because of their stings reported in Kashan. In the present study, we examined the habitat and normal activity location of these creatures.

MATERIALS AND METHODS

This descriptive study was performed to identify the habitats of velvet ants in Kashan, Isfahan Province, and sampling was accomplished 16 times at sunset and early evening of spring and summer. A total of 45 infested houses and carpentry workshops around them were sampled in Kashan, where the presence of velvet ants was confirmed in all these places. Sampling was done by the census method. The places studied for velvet ant catching were in residential areas or around them. The duration of each sampling was 3 hours from 8 pm to 11. The number of participants was 3 people. At night using a flashlight in the courtyard and keeping it at a distance of 20-15 cm velvet ants were collected using forceps from the floor, sides of walls, inside the rooms, split among the mosaics, and under the rug and carpet. Then they were transferred to the laboratory in the containers with lids, containing numbers and basic information e.g. date and place of the collection. Next, their accurate species were identified by the identification key and under consideration of morphological parameters using a stereomicroscope. Also, the studied areas, regional characteristics, the number of sampling, the number of catching at each time, as well as generally collected data from the place of catching were presented with statistics, photographs, and descriptive tables. All data were analyzed according to the relevant laws and guidelines of the ethical standards of the Declaration of Helsinki.

RESULTS AND DISCUSSION

During the study, 334 velvet ants were caught (**Figures 1 and 2**). Catching areas and methods, and their number are presented in **Table 1**. The findings showed that velvet ants existed in all 45 locations. The average number of velvet ants collected at each sampling was 20. The highest rate of catch during the day was from the living rooms, inside the warehouse and under the carpet and rug. The highest rate of catch during the night and darkness was under the door lights of houses and inside the courtyards of houses in Ravand city and Qutb town. Velvet ants occupy various places inside residential houses, outside houses, and on the outskirts of Kashan city. They live during the day in warm weather in crevices or holes that are not exposed to light. Cracks in the concrete wall of gardens, cavities, and cracks in the old mud walls of gardens and homes are among these cases (**Figures 3-5**). Velvet ants mostly live on the side of courtyard walls and fissure in the foundation walls and below the ground level where the humidity is enough. This species was observed under the separated pieces of the courtyard floor mosaics. In short, shelters of velvet ants during the day in the studied area were in cracks and holes under rocks, under the bark of the tree trunks, inside the cracks in the garden wall of houses, under wood and timber, and holes of muddy and brick walls. At night and after the dark, they come out of their shelters and are seen in the courtyard of houses, on the wall and often under the lights. Also winged or males types were identified in this situation.

Table 1. The location and sampling time of velvet ants by location, in infested areas in Kashan city

Place of sampling	Day	Night	Total
Side of courtyard	-	22	22
Inside the cracks and seams mosaic floor of the courtyard	-	54	54
Inside the living room and stockroom	62	-	62
Under the carpet and rugs	40	-	40
Porch of homes	-	10	10
Inside the carpentry workshop	22	-	22
Under the bark of trees	10	-	10
Home entrance and exit door under the light	-	84	84
Courtyard floor of homes	-	30	30
Total	134	200	334

Percent	40	60	100
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Figure 1. Alive female velvet ants in the laboratory



Figure 2. Left: Head of the velvet ant. Right: Abdomen and stinger of the velvet ant.



Figure 3. Habitat of velvet ants inside the infested homes



Figure 4. Infestation of velvet ants in dark places in the infested homes



Figure 5. Activity location of the velvet ants on the border of the town

The results of the study showed that the velvet ants live in a wide range of places, inside and outside houses and on the outskirts of villages and towns. Velvet ants live inside the gaps or holes, which normally have high humidity. These cases included gaps in the gardens cement wall, inside the cracks and seams of the mosaics, inside the cavities and crevices, the old walls of workshops and residential houses. Velvet ants usually live at the lowest holes and fissures in the foundation wall or inside the ground, where the moisture is available enough and protects them from the hot and dry weather. It seems that hot and dry climate was the cause to enter into any gaps or holes during the day to survive in this dry climate and provides proper shelters for velvet ants in this area. This behavior is like the rest of other arthropods including scorpions, solifuges (sun spiders), and even reptiles [31-33].

According to local and indigenous people in the central region of Kashan, due to the stings and harassment of velvet ants, they have been repeatedly sprayed with strong pesticides, but after a while, their population has increased again and they have continued to cause harassment. It seems resistance to insecticides in Iran is not only limited to malaria vectors, but also it has occurred in insects with medical and health importance such as velvet ants [34]. These velvet ants were also exposed to insecticides when spraying against mosquitoes. For this reason, in recent years, after the increase in the population of velvet ants, their resistance to insecticides has been observed in a relatively short period of time. Due to the risks of environmental pollution of chemicals, it is necessary to investigate the possibility of using

low-risk and environmentally friendly pesticides to combat pests. What was important about the velvet ants in this area was the sharp increase in population and their expansion, which increased every year, and therefore their contact with humans increased. With the increase in cases of velvet ants stings, people's complaints also increased. Some people suffered more injuries than others caused by sting. Most people were unable to perform normal activities due to the sting. That is why the sting of these insects is also important among the military forces [35-38].

CONCLUSION

According to preliminary studies in the past few years, every year more residential houses in Kashan City were infested to velvet ants. It is recommended to train home and individual protection methods, awareness of the life cycle of these pests, choose the right time to fight them to avoid the possibility of insecticide resistance, and improve residential environments.

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ETHICS STATEMENT: All data were analyzed according to the relevant laws and guidelines of the ethical standards of the Declaration of Helsinki. The Ahvaz Jundishapur University of Medical Sciences research review committee revised the research proposal according to the rule and regulation. The ethical principles of this research were investigated and discussed in the research committee of the above mentioned department and after making needed modifications, it was approved.

Accordingly, the study was approved by the Ethics Committee of Ahvaz Jundishapur University of Medical Sciences (ID: IRAJUMS.REC.1400.211). This project has been financially supported by Student Research

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