

Original Article

New Data on *Latrodectus tredecimguttatus* Rossi, 1790, the Medically Important Spider Species (Araneae: Theridiidae) from Iran

Mohammadi Bavani, M¹*, Shafaie, S², Chavshin, A. R¹, Dabiri, F¹, Badakhshan, M¹,
Naghian, A¹, Entezar Mahdi, R³, Seyyed-Zadeh, S. J¹, Rafinejad, J⁴, Saedi, Sh⁴,
Rasegh, P⁵

1. Department of Medical Entomology and Vector Control, School of Public Health, Urmia University of Medical Sciences, Urmia, Iran
2. Department of Biology, Faculty of Sciences, Ferdowsi University of Mashhad, Mashhad, Iran
3. Department of Epidemiology, School of Medicine, Urmia University of Medical Sciences, Iran
4. Department of Medical Entomology and Vector Control, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran
5. Disease Control Unit, Makoo Health Center, Urmia University of Medical Sciences, Urmia, Iran

Received 12 February 2020; Accepted 19 April 2020
Corresponding Author: mohammadi.mo@umsu.ac.ir

Abstract

Spiders are one of the most important orders of Arachnida comprising more than 48,000 species in the world. Except for families Uloboridae and Holarchaeidae, all others are classified as the venomous spider. However, only about 200 species are medically relevant and cause public health problems or even death. In Iran, there are 51 families and 763 species of spiders, of which the families, Theridiidae and Sicariidae are dangerous for the human being, and the first one is more prevalent. The *Latrodectus* is considered one of the most poisonous spiders in the world and Iran. This genus has five species in Iran, among which *Latrodectus tredecimguttatus* (black widow spider or “Dolmak”) is considered one of the most poisonous spiders in Iran. Therefore, this study aimed to investigate this species in the Northwest of Iran (West Azerbaijan, East Azerbaijan, and Ardabil provinces, Iran). Spatial distribution maps were prepared using GIS 9.4. In the current study, five adult female spiders were collected from Germe and Ardabil cities (Ardabil Province), Ahar County (East Azerbaijan province), and Urmia city (West Azerbaijan province) of Iran. These species were first observed in Ardabil province, Iran. Therefore, the presence of *Latrodectus* species under the rocks in wheat farms in this corner of Iran may be a threat to farms and visitors. People in these areas should wear gloves and avoid any activity that disturbs the spiders and make them aggressive.

Keywords: Araneae, Iran, *Latrodectus tredecimguttatus*, Theridiidae

Nouvelles données sur *Latrodectus tredecimguttatus* Rossi, 1790, les espèces d'araignées médicalement importantes (Araneae: Theridiidae) d'Iran

Résumé: Les araignées sont l'un des ordres les plus importants d'Arachnida comprenant plus de 48,000 espèces dans le monde. À l'exception des familles *Uloboridae* et *Holarchaeidae*, toutes les autres sont classées comme l'araignée venimeuse. Cependant, seules environ 200 espèces sont médicalement pertinentes et causent des problèmes de santé publique, ou même la mort. En Iran, il existe 51 familles et 763 espèces d'araignées, dont les familles, *Theridiidae* et *Sicariidae* sont dangereuses pour l'être humain, et la première est plus répandue. Le *Latrodectus* est considéré comme l'une des araignées les plus venimeuses au monde et en Iran. Ce genre

compte cinq espèces en Iran, parmi lesquelles *Latrodectus tredecimguttatus* (araignée veuve noire ou "Dolmak") est considérée comme l'une des araignées les plus venimeuses d'Iran. Par conséquent, cette étude visait à enquêter sur cette espèce dans le nord-ouest de l'Iran (provinces de l'Azerbaïdjan de l'Ouest, Azerbaïdjan de l'Est et Ardabil, Iran). Des cartes de répartition spatiale ont été préparées à l'aide du SIG 9.4. Dans la présente étude, cinq araignées femelles adultes ont été collectées dans les villes de Germe et Ardabil (province d'Ardabil), de la préfecture d'Ahar (province de l'Azerbaïdjan de l'Est) et de la ville d'Urmia (province de l'Azerbaïdjan de l'ouest) en Iran. Ces espèces ont été observées pour la première fois dans la province d'Ardabil, Iran. Par conséquent, la présence d'espèces de *Latrodectus* sous les rochers dans les fermes de blé de ce coin de l'Iran peut constituer une menace pour les fermes et les visiteurs. Les habitants de ces régions devraient porter des gants et éviter toute activité qui dérange les araignées et les rend agressives.

Mots-clés: Araneae, Iran, *Latrodectus tredecimguttatus*, Theridiidae

1. Introduction

Spiders are one of the most important orders of Arachnida. More than 48,000 spider species have been reported worldwide. Nearly all spiders except the families Uloboridae and Holarachaeidae are classified as venomous arthropods. However, only about 200 spider species are medically important and cause public health problems or even death (Isbister and Fan, 2011; Mirshamsi et al., 2015; Zamani, 2016). Until now 763 spider species belonging to 51 families have been reported from Iran. It should be noted that two spider families of Theridiidae Sundevall, 1833, and Sicariidae Keyserling, 1880, in Iran are dangerous for humans (Garb et al., 2004; Afshari et al., 2009; Dehghani, 2015; Dehghani et al., 2017; Platnick, 2019).

The Theridiid *Latrodectus* Walckenaer, 1805 is known as the black widow spider and is considered to be one of the most poisonous genera of spiders in the world and in Iran (Rafinezhad et al., 2000; Rahmani et al., 2014; Sanaei-Zadeh, 2017). This genus has 32 species in the world and 5 species in Iran (Platnick, 2019). *L. tredecimguttatus* Rossi, 1790 is one of the medically important spider species, known as the Mediterranean widow spider or "Dolmak". The wide geographical distribution of this spider along with its poisonous bites, which causes death or serious complications, places it in the list of dangerous animals (Rafinezhad et al., 2000; Mood et al., 2008). Therefore, this study aimed to increase public knowledge on the presence of *L. tredecimguttatus* in Ardabil, East, and

West Azerbaijan provinces of Iran. This information would be valuable for the implementation of spider control plans and resolving the relevant public health problems in the future.

2. Material and Methods

This study was conducted in West Azerbaijan, East Azerbaijan, and Ardabil provinces, located in the Northwest of Iran to determine the presence of medically important spider species, especially the *Latrodectus* genus. Given the fact that *L. tredecimguttatus* spiders generally live under the rocks, sampling was conducted by moving the rocks (rock rolling method) inside the fields, gardens, cemeteries, and backyards. Afterward, the found spiders were captured by forceps and transferred to a plastic container containing 75% ethyl alcohol. The information related to sampling sites, such as latitude, longitude, altitude, as well as environmental factors, such as temperature and relative humidity were recorded.

Subsequently, the specimens were transferred to the entomology laboratory at the Faculty of Health in Urmia University of Medical Science, Urmia, Iran, and identified under the stereomicroscope using a morphological identification key (Nentwig et al., 2003). A Canon EOS-1Ds camera and an Olympus SZH-10 stereo-microscope were used to take photos. Moreover, the geographical distribution map was prepared using GIS.

3. Results

In total, five female spiders were captured and identified as *L. tredecimguttatus*, (Two specimens were

caught in each of West Azerbaijan and Ardabil Provinces, and one specimen was captured from the East Azerbaijan Province) which was considered the most medically relevant species in Iran. This is the first report of this medically important spider species in Ardabil province, Iran. Therefore, this medically important species have been reported from Ardabil Province of Iran in the present study for the first time.

3.1. Family Theridiidae Sundevall, 1833. Genus *Latrodectus* Walckenaer, 1805. Diagnosis

Theridiid with remarkable sexual dimorphism; large females; small to medium-sized araneomorph spiders ranged from 3-25 mm; ecribellate; entelegyne; eight eyes; legs with no or few spines; tarsi IV with a row of lightly curved, serrated bristles; three tarsal claws; modified and aggregate silk glands; sticky silk is used to wrap prey (spider families), male palpal tibia distally widened; no paracymbium; the female can be identified by the hourglass pattern, red or orange, on the ventral aspect of her shiny, globose black abdomen. (Peterson and McNalley, 2013).

3.2. *Latrodectus tredecimguttatus* Rossi, 1790 (Figure 1 and Figure 2). Material Examined. IRAN

2♀ West Azerbaijan Province, Urmia City, 37° 39' 10.44" N 46' 20.6394" E, 1952 m, 15.9.2019, M. Mohammadi.

1♀ East Azerbaijan, Ahar City, 38° 23' 43.7994", 46°58'8.7594", 1642m, 30.8.2015, M. Mohammadi

1♀, Ardabil, Germe City, 39°01'46" N, 48°04'54"E, 844m, 14.7.215, M. Mohammadi.

1♀, Ardabil, Ardabil City, 38°14'10" N, 48°16'52"E, 1791m, 5.7.2015, M. Mohammadi.

3.3. Diagnosis

Females with a completely black abdomen and lip-shaped epigyne.

3.4. Description. Female (from Ordushahi)

Measurements: total length 11.3; carapace 5.4 long, 4.5 wide.

Prosoma. Carapace, sternum, labium, maxillae, chelicerae and clypeus black (Figure 2).

Abdomen. Dorsum, Venter and Spinnerets black (Figure 2).

Legs. Coxae–tarsi I–IV black. (Figure 2)

3.5. Distribution in Iran

Alborz, Bushehr, East and West Azerbaijan, Ardabil, Fars, Golestan, Hormozgan, Khuzestan, Mazandaran, North Khorasan, Qom, Razavi Khorasan, Semnan, Tehran (Figure 1).

3.6. Worldwide Distribution

Mediterranean, Ukraine, Caucasus, Russia (Europe to South Siberia), Kazakhstan, Iran, Central Asia, China.



Figure 1. Spatial distribution map of *Latrodectus tredecimguttatus* in Iran till 2019



Figure 2. *Latrodectus tredecimguttatus* (from northwest of Iran): Dorsal (left) and Ventral (right) view

4. Discussion

Theridiidae is the fifth largest spider family with 2515 species belonging to 124 genera (Platnick, 2019). These species are classified as highly toxic spiders which can cause morbidity and even mortality (Afshari et al., 2009). The poisonous bites made the researchers want to know more about them (Jäger and Gromov, 2011). *L. tredecimguttatus* is the most medically relevant spider species in Iran and its bite causes health problems and even death in rare cases in humans. Moreover, many studies, especially in the northeast of Iran, have been conducted on it due to its medical importance (Mirshamsi, 2005). Sporadic studies on this spider have been conducted in other parts of Iran as well (Rafijened et al., 1970; Afshari et al., 2009; Rahmani et al., 2014; Zamani et al., 2014; Hayder et al., 2018)

Other than the morphological characteristics of these spiders and the variation among populations, it is important to know about their distribution in order to be prepared for the possible injuries.

Most spider bites have not been confirmed by eyewitnesses, and spiders are not brought to the medical centers by the bitten persons for identification. There are no national or international centers to record spider bites. However, this information is recorded in some countries. During 1995-2004, 82 cases of spider bites have been reported from Turkey. In addition, *Latrodectus* spider species, such as *L. tredecimguttatus*

have been captured in Turkey. This species is likely to be responsible for most spider bites in Turkey (Cesaretli and Ozkan, 2011). Only 12 confirmed cases of spider bites by *L. tredecimguttatus* species have been reported (Diaz, 2004) in Spain during 1984-1944.

In North Khorasan province, Iran, 195 cases of spider bites have been reported during 1994-1997. *L. tredecimguttatus*, *L. dahli*, and *L. geometricus* species were reported in a faunistic study conducted on the species of *latrodectus* spiders in this province with the *L. tredecimguttatus* as a more prevalent species (Rafinezhad et al., 2000).

In total, 5 out of 48 Theridiid species found in Iran belong to the genus *Latrodectus*. The presence of *Latrodectus* in Iran was first reported by Pocock (1899) who identified *L. tredecimguttatus* in Urmia Lake. Subsequent to his work, some other foreign scientists conducted studies in this regard. It is worth mentioning that Iranian researchers started to work on this genus one century after the first report. The mentioned five species include *L. cinctus* Blackwall, 1865, *L. dahli* Levi, 1959, *L. geometricus* C. L. Koch, 1841, *L. pallidus* O. P.-Cambridge, 1872, and *L. tredecimguttatus*. They have the most widespread distribution in the northeast and the southern parts of Iran (Mirshamsi, 2005; Rahmani et al., 2014; Zamani et al., 2014; Sanaei-Zadeh, 2017; Khadem-Rezaiyan et al., 2018). However, Pocock did not provide

sufficient data about the exact sampling locality of *L. tredecimguttatus* at West or East Azerbaijan provinces, Iran. The present study confirms the presence of *L. tredecimguttatus* in Urmia (West Azerbaijan province), Ahar (East Azerbaijan province), and Germe and Ardabil (Ardabil Province), Iran. This is the first record of this species from Ardabil province and there was no data about this species from Ardabil Province. No spider bite has been reported from West Azerbaijan and Ardabil provinces. However, *L. dahli* has been reported from East Azarbaijan province as the medically important spider (Rahmani et al., 2014). Therefore, there are two medically important species in this province which include *L. tedecimguttats* and *L. dahli*. It can be concluded that the northwest of Iran is a suitable habitat for the genus *Latterodectus*, especially *L.tredecimgutattus* species.

Conclusion

Based on the obtained results, spider bites are almost common in the Khorasan Razavi province of Iran and are mostly caused by *L. tredecimguttatus* genus. Moreover, the presence of *Latrodectus* species in wheat fields of West and East Azerbaijan and Ardabil provinces can be an alarm for farmers and visitors to use gloves and warn people about activities that may disturb the spiders or make them aggressive.

Authors' Contribution

Study concept and design: M. M. B., A. R. Ch., F. D. and R. E. M.

Acquisition of data: M. M. B., A. R. Ch. And Sh. S.

Analysis and interpretation of data: M. M. B. and Sh. S.

Drafting of the manuscript: M. M. B., A. R. Ch., Sh. S. and M. B.

Critical revision of the manuscript for important intellectual content: M. M. B. and Sh. S.

Statistical analysis: M. M. B. and J. R.

Administrative, technical, and material support: M. M. B., A. N., Sh. S, P. R. and S. J. S.,

Ethics

The authors declare that all ethical standards have been observed in the preparation of this study.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this study.

Grant Support

This study was financially supported by the Research Deputy, Urmia University of Medical Sciences, Urmia, Iran (Project No. 2545).

Acknowledgment

The authors would like to thanks all the health staff of the selected counties who were involved in the field support of this study.

References

- Afshari, R., Khadem-Rezaian, M., Balali-Mood, M., 2009. Spider bite (latrodectism) in Mashhad, Iran. *Hum Exp Toxicol* 28, 697-702.
- Cesaretli, Y., Ozkan, O., 2011. A clinical and epidemiological study on spider bites in Turkey. *Asian Pac J Trop Med* 4, 159-162.
- Dehghani, R., 2015. Venomous Animals; Are They Important in Iran. *Int Arch Health Sci* 2, 167-169.
- Dehghani, R., Talaei, R., Rafeenejad, J., Rezvani, S.R., Karimi, F., 2017. Brown widow spider bite (*Loxosceles* sp., Araneae, Sicariidae): A case report from Kashan, Iran. *Iran J Dermatology* 20, 32-35.
- Diaz, J.H., 2004. The Global Epidemiology, Syndromic Classification, Management, and Prevention of Spider Bites. *Am J Trop Med Hyg* 71, 239-250.
- Garb, J.E., Gonzalez, A., Gillespie, R.G., 2004. The black widow spider genus *Latrodectus* (Araneae: Theridiidae): phylogeny, biogeography, and invasion history. *Mol Phylogenet Evol* 31, 1127-1142.
- Hayder, A., Ishraq, B., Hula, F., 2018. Taxonomic and Molecular Study of the Widow Spider Genus *Latrodectus* Walckenaer, 1805 (Araneae: Theridiidae) In Iraq.

- Isbister, G.K., Fan, H.W., 2011. Spider bite. *The Lancet* 378, 2039-2047.
- Jäger, P., Gromov, A.V., 2011. First records of *Latrodectus dahli* Levi, 1959 from Morocco, Turkey, Turkmenistan and the United Arab Emirates. *Arachnology* 188-192, 185.
- Khadem-Rezaiyan, M., Moallem, S.R., Afshari, R., 2018. Epidemiology of Snake, Spider and Scorpion Envenomation in Mashhad, Khorasan Razavi, Iran (2004-2011). *Iran J Toxicol* 12, 27-31.
- Mirshamsi, O., 2005. Faunistic study of spiders in Khorasan Province, Iran (Arachnida: Araneae). *Iran J Anim Biosyst* 1, 59-66.
- Mirshamsi, O., Marusik, Y.M., Zamani, A., Moradmand, M., Kashefi, R., 2015. Annotated checklist of the spiders of Iran (Arachnida: Araneae). *Iran J Anim Biosyst* 2015, 1-108.
- Mood, M., Afshari, R., Rezaiyan, M., 2008. Clinical, Paraclinical, and Electocardiographic Changes of Spider Bite in North East Iran, 2005 2006. *Clin Toxicol* 45, 371-377.
- Nentwig, W., Hänggi, A., Kropf, C., T., B., 2003. Central European spiders determination key.
- Peterson, M.E., McNalley, J., 2013. Chapter 79 - Spider Envenomation: Black Widow. In: Peterson, M.E., Talcott, P.A. (Eds.), *Small Animal Toxicology* (Third Edition), W.B. Saunders, Saint Louis, pp. 817-821.
- Platnick, N.I., 2019. World Spider Catalog.
- Pocock, R., I., 1899. Chilopoda and Arachnida. In: Günther, R.T. (Ed.), *Contribution to the natural history of Lake Urmi, N. W. Persia, and its neighbourhood*, Bot J Linn Soc., pp. 399-406.
- Rafijened, J., Tirgari, S., Biglarian, F., Shemshad, K., 1970. Systematics, Bioecology, and Medical Importance of Widow Spiders (*Latrodectus* spp.) in Khorasan Province, Iran. *J Arthropod Borne Dis* 1, 152-157.
- Rafinezhad, J., Tirgari, S., BALALI, M., 2000. A Study on Distribution of Poisonous Species of Genus *Latrodectus* Spp. In Khorasan Province with on Emphasis on Medical Impostance (Araneae; Theridiidae). *Daneshvar Medicine* 7, 31-38.
- Rahmani, F., Khojasteh, S.M., Bakhtavar, H., Nia, K., Roohi, A., Massoud, A., et al., 2014. Identification of Widow Spider in East Azerbaijan, Iran: case series. *Med J Tabriz Univ Med Sci Health Serv* 36, 82-86.
- Sanaei-Zadeh, H., 2017. Spider Bite in Iran. *Electron Physician* 9, 4703-4707.
- Zamani, A., 2016. *The Field Guide of Spiders and Scorpions of Iran*. Iranshenasi Publication 2016.
- Zamani, A., Mirshamsi, O., Savoji, A., Shahi, M., 2014. Contribution to the distribution of spiders with significant medical importance (Araneae: *Loxosceles* and *Latrodectus*) in Iran, with a new record for the country. *Iran J Anim Biosyst* 10, 57-66.