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Description Study to the Spider Latrodectus cinctus (Black Widow) (Araneae: Theridiidae) in Baghdad / Iraq

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Abstract

This study investigates the Black Widow spider (Latrodectus cinctus) in Baghdad, Iraq. Limited knowledge exists regarding its distribution, behavior, and public health impact within the city. The research aims to identify the distribution and abundance of Latrodectus cinctus in Baghdad, analyze the ecological factors influencing its presence in urban environments, assess the public health implications of Black Widow spider bites, raise awareness about the risks associated with this spider, and propose management strategies to mitigate these risks. Field surveys, laboratory analyses, and data modeling will be employed. Black Widow spiders were collected on July 11, 2023, from the Abu Ghraib district, west of Baghdad. Morphological characteristics were used for identification following established protocols.

Keywords:

Baghdad, black widow spider, ecology, iraq, latrodectus cinctus, management strategies, public health, spider bites, theridiidae.

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Introduction

The Black Widow spider (Latrodectus cinctus), belonging to the family Theridiidae, is one of the most notorious arachnids globally due to its venomous bite. Despite its prevalence and potential danger, there is a significant gap in understanding its distribution behavior and impact on human populations in Baghdad Iraq. This study aims to work on these cognition gaps and render an understanding of the bionomics and state health implications of the Black Widow spider urban area. Importance and Problem Statement: The presence of the Black Widow spider in urban areas such as Baghdad poses potential risks to public health and safety (Vladimir Malbasic, 2021). Notwithstanding, modest research has been conducted along this variety inside the metropolis limits up to the amiss of consciousness and readiness among the community universe and healthcare providers. Also, the factors influencing the distribution and abundance of Black Widow spiders in urban environments remain poorly understood. Addressing these cognition gaps is relevant for applying good direction strategies and mitigating the prospective risks associated with Black Widow spider bites within this frame. The "niche" refers to the role and set of amp variety inside associate in the nursing ecosystem comprehensively its habitat

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preferences, imagination, employment patterns, and interactions with different organisms (Lotz, 1994). Habitat preferences: niche theory allows us to dive into the specific habitat preferences of the Black Widow spider (Latrodectus cinctus) (Lotz, 1994; Levi & Levi, 2014).

These preferences encompass various environmental factors such as temperature, humidity, vegetation type, shelter availability, and human-made structures (Foelix 2011). Away examining the dispersion of Black Widow spiders over disparate citified habitats inside Baghdad, we can identify key environmental variables that cast their habitat removal (Bala Krishna, 2021). For instance, Black Widow spiders are known to favor dark, secluded areas such as crevices, corners, and cluttered spaces in urban settings (Platnick 2005). Supply Utilization: The niche concept extends to the supply utilization patterns of the Black Widow spider (Prendini & Wheeler, 2005). This includes its light feed removal and forage conduct (Foelix, 2011). Black Widow spiders primarily feed on small arthropods such as insects and other spiders (Levi & Levi, 2014). Done corner hypothesis search, however, for variations in feed accessibility and copiousness determine the dispersion and copiousness of Black Widow spiders in citified environments (Tran & Ngoc 2024). For example, higher densities of Black Widow spiders usually proliferate in places where there is high activity of insects or closeness to prey habitats. Interactions with different species: Corner hypothesis also sheds light on the interactions betwixt the Black Widow spider and different varieties sharing its habitat (Levi & Levi, 2014). These interactions may possibly include harsh competition with other spider species for supplies, predation on or by other organisms and potential symbiotic relationships (Jocqué & Dippenaar-Schoeman 2006). i,e., Black Widow spiders contend with various spider species that occupy similar niches in urbane environments (Foelix, 2011). Furthermore, interactions with predators like birds or mammals may undoubtedly influence the spatial distribution and behavior of Black Widow spiders (Garb et al., 2004; Al-Azawi, 2020).

Habitat preferences form the core of creating distribution and abundance patterns of the Black Widow spider in cities like Baghdad (Hlushenkova et al., 2024). These are controlled by a vast array of environmental conditions that cumulatively determine the habitat suitability of the varieties (Saidova et al., 2024). Delving into the specifics of these preferences not only assists in predicting the spatial distribution of Black Widow spiders but also provides us with knowledge about their ecological requirements and behavior in cities (Garb et.al., 2004)

Temperature: Temperature is another important environmental consideration that affects Black Widow spider preferences for the place they live in. Even if these spiders may survive within broad temperature ranges, they normally prefer places where they have moderate temperatures (Foelix 2011). In Baghdad, where summer temperature can be very high, Black Widow spiders may find cooler microhabitats such as shaded areas, underground burrows, or water-accessible areas to keep their body temperature stable and avoid desiccation.

Humidity: Humidity levels also have a substantial role in shaping the habitat preferences of Black Widow spiders. These spiders favor environments with higher humidity levels of arsenic to plain conditions that threaten their survival (Garb *et al*. 2004; Foelix, 2011). In urban settings, humidity levels may vary depending on factors, such as vegetation cover, proximity to water bodies, and human activities. Black Widow spiders thrive easily in areas with higher humidity such as arsenic gardens, parks, or areas with obtuse flora that hold wet (Platnick, 2005).

Vegetation Type: The type and density of vegetation in an urban habitat can influence the presence of Black Widow spiders. Although these spiders are not arboreal, they employ flora as vegetation substratum for the construction of their webs or as protection from predators and contrary weather conditions (Foelix, 2011). In Baghdad, Black Widow spiders may be found in areas with vegetation cover such as parks, gardens, and green spaces, where they can find suitable sites for web construction and refuge (Al-Azawi, 2020; WSC, 2022).

Shelter Availability: Shelter availability is a critical factor influencing the habitat preferences of Black Widow spiders. These spiders are nocturnal and favor blue, secret areas for protection and web construction (Foelix, 2011). In urban environments, they may inhabit a variety of human-made structures such as constructing sheds, garages, and debris piles, which provide ample hiding places and protection from predators (Platnick, 2005). The availability and dispersion of protection sites inside Baghdad are important for predicting the special dispersion of Black Widow spiders in citified areas. Human-made Structures: Human-made structures, including constructing walls, fences, and infrastructure, can significantly influence the habitat preferences of Black Widow spiders (Platnick, 2005). These spiders are often found near human habitation where they can exploit the microhabitats provided by urban structures. In Baghdad, Black Widow spiders' dwell in cracks, and crevices in constructing corners of suites, and store areas, where they get rest obscure and calm. Supply utilization patterns are integral to understanding the ecological niche of the Black Widow spider and its distribution within urban environments like Baghdad. By exploring the spider's light feed removal and forage conduct, we get a clear important understanding of the factors that drive its copiousness and dispersion finally elucidating the ecologic kinetics astatine run in citified ecosystems. Diet Composition: The Black Widow spider's diet primarily consists of small arthropods including insects and other spiders (Koh 1998; Foelix, 2011). This dietetic specialization influences its imaginative employment patterns and forage conduct inside citified environments. By preying on a diverse array of arthropods Black Widow spiders play a decisive role in regulating insect populations and maintaining ecological balance within urban ecosystems (Levi & Levi, 2014).

Understanding the composition of the spider's diet provides valuable information about its trophic interactions and ecological role in urban food webs. Prey Selection: Niche theory allows us to explore how variations in prey availability and abundance influence the Black Widow spider's prey selection patterns (Camp 2014). In citified environments, factors such as arsenic habitat structure, flora back, and human activities determine the copiousness and diversity of feed variety to Black Widow spiders. For example, areas with high insect activity such as gardens, parks, and green spaces, may attract higher densities of Black Widow spiders due to the availability of suitable prey. Through a careful examination of the Black Widow spider's feeding preferences, we can better understand the ecological factors that significantly influence its distribution and abundance in densely populated urban ecosystems. The foraging behavior of Black Widow spiders is strongly shaped by a combination of environmental cues, prey availability, and habitat characteristics. (Foelix, 2011). These are nocturnal feeders, arthropod-hunting nighttime predators, making active use of their webs and silk draglines to capture and overpower unsuspecting arthropods. For urban Black Widows, these would sometimes play themselves out against and around the diverse human-provided structures and developments to enable opportunistic foraging for food as hunting platforms (Platnick, 2005).

By looking at the spider's foraging pattern, we are able to get a deeper understanding of its movement pattern, environmental habitat, and co-occurrence with prey species in the ecosystems of urban environments. Ecologic dynamics: changes in accessibility and abundance level flat impact the dispersion and abundance of Black Widow spiders in citified environments (Peterson. 2006). The areas of higher feed densities are able to sustain higher densities of Black Widow spiders, and the areas with moderate amounts of feed have lower densities of spiders. Research of the ecological process between the Black Widow spider and their prey niche theory is able to explain the mechanism governing the distribution and abundance patterns of the spider in urban ecosystems. These interactions with other types are important to the ecologic corner formation and dispersal of the Black Widow spider in urbanized settings such as Baghdad. Niche theory provides a useful model for understanding these interactions, which involve various ecological processes such as competition, predation, and potential symbiotic relationships. Competition: among urbanized environments, Black Widow spiders compete for assets such as arsenic feed shelter and necessitate (Levi & Levi, 2014). Competition over assets has the power to promote spatial distribution and thickness of Black Widow spiders and particular in areas in which several spiders' species interact (Jocqué & Dippenaar-Schoeman, 2006). For example, Black Widow spiders may compete with other web-constructing spiders for suitable web-constructing sites or prey supplies. The reason behind the aggressive interactions between Black Widow spiders and different spider varieties shed light on the factors influencing their habitat removal and universe kinetics inside citified ecosystems. Black Widow spiders are not only predators but also feed on a breed of different organisms inside citified environments (Nicholson & Graudins 2002; Foelix, 2011). Predatory interactions with birds, mammals, and predatory insects may influence the spatial distribution and behavior of Black Widow spiders (Platnick 2005). For example, birds like arsenic shrikes and some mammal species consume Black Widow spiders, altering their abundance in specific environments. In contrast, predation pressure from Black Widow spiders on insects indirectly affects the population of prey organisms in urban environments.

Studying these predator interactions helps elucidate the broad ecological niche of Black Widow spiders within city food webs. Symbiotic Relations: A little less explored, Black Widow spiders can also enjoy potential symbiotic associations with other species in the urban environment (Jelinek, 1997; Foelix, 2011). Epidemiological research begins by examining patterns of illness and health events correlated with Black Widow spider bites within Baghdad. This entails establishing the frequency and distribution of cases of spider bites, temporal trends, and spatial patterns of occurrence. By systematic documentation of these occurrences, scientists are able to comprehend the epidemiology of spider envenomation and its impact on public health. The Black Widow spider, or Latrodectus, is a venomous arachnid species found in most regions of the globe, including Baghdad, Iraq. The research aims to discuss the types of bites, their symptoms, toxicity level, and treatment procedures pertaining to Black Widow spider envenomation.

Types of Bites: delve into the two types of bites surely associated with Black Widow spiders: Dry Bite: Dry bites occur when a Black Widow spider bites its victim without injecting venom into the bloodstream. In such cases, the spider may defensively bite as a response to disturbance or perceived threat, but it does not release its venom. Mechanism: Once bitten a by Black Widow spider, it normlly delivers venom through its fangs into the victim's skin. Nonetheless, in a Dry Bite scenario, the spider may possibly choose not to inject venom, potentially due to various factors like inadequate stimulation, defensive strategy, or other unknown reasons (White & Meier, 2017; Levi & Levi, 2014). Symptoms: Since no venom is injected during a Dry Bite, the symptoms experienced by the victim are usually limited to those associated with the mechanical puncture wound caused by the spider's fangs. These may include localized pain, redness, swelling, and minor irritation at the bite site. Management: Treatment for Dry Bites primarily involves basic wound care, such as cleaning the affected area with soap and water, applying a cold compress to reduce swelling, and using over-the-counter pain relievers to alleviate discomfort. In most cases, Dry Bites do not require specific medical intervention beyond symptomatic relief. An Envenomed Bite occurs when a Black Widow spider injects its venom into the victim's bloodstream along with the bite.

This type of bite results in the delivery of toxic compounds contained within the spider's venom, leading to various systemic effects. Mechanism: envenomed bites affect the shot of cogent neurotoxic malice away from the Black Widow spider into the victim's tissues. The venom contains a mixture of proteins and peptides that target the nervous system disrupting neurotransmission and leading to symptoms characteristic of Black Widow spider envenomation (Isbister *et al.,* 2003; Foelix, 2011).

Extent of Toxicity: The extent of toxicity associated with Black Widow spider venom can vary depending on factors such as the amount of venom injected, the individual's age and health status, and the promptness of medical intervention. Here's a detailed overview of the expanse of perniciousness and prospective consequences of Black Widow spider envenomation: neurotoxic parts Black Widow spider malice contains neurotoxic parts that specifically point to the anxious unit. These neurotoxins act by interfering with neurotransmission, specifically at the neuromuscular junction, leading to a range of systemic effects. General effects: The general personal effects of Black Widow spider envenomation are difficult sinew cramps and spasms abdominal hurt sickness, vomit, wet concern, vertigo, and high blood pressure (Clark *et al*. 1992; Peterson, 2006).

These symptoms result from the neurotoxic effects of the venom on various organ systems, including the muscles, gastrointestinal tract, autonomic nervous system, and central nervous system morbidity. While Black Widow spider envenomation is typically not lethal, severe cases can result in significant morbidity and impairment of daily functioning. Severe muscle spasms and abdominal pain may lead to difficulty in movement and activities of daily living. Gastrointestinal symptoms such as nausea and vomiting can cause dehydration and electrolyte imbalances if left untreated. Neurological symptoms such as headache, dizziness, and hypertension may exacerbate existing health conditions or predispose individuals to complications such as stroke or cardiovascular events. (Cesaretli & Ozkan, 2011; Foelix, 2011). Antivenomous Therapy: Description: Antivenomous, also known as antivenin, is the primary treatment for severe cases of Black Widow spider envenomation. It is an antidote that is directly in the form of antibodies that target and neutralize the venom toxins. Mechanism: Antivenomous acts by binding to the venom molecules present in the blood, preventing them from triggering their toxic effects on the victim's tissues. Venom activity is neutralized to help decrease symptoms and prevent further progression of envenomation. Administration: Antivenomous is typically administered intravenously under medical supervision. The dosage and frequency of administration depend on factors such as the severity of envenomation, the patient's age and weight, and the specific antivenomous product used. Efficacy: Antivenomous therapy is highly effective in neutralizing the toxic effects of Black Widow spider venom and rapidly alleviating symptoms. It can lead to a significant reduction in pain, muscle cramps, and other systemic effects within a relatively short time frame. **(**Escoubas, *et al*. 2000; Foelix, 2011).

Materials and Methods

Collection site*:* The spider ***Latrodectus cinctus*** was collected on 11-7-2023 from a field and old trees located in the Abu Ghraib district about 10.7 km, west of Baghdad in Iraq (33°17′31″N 44°03′56″E). The specimen was preserved in 70% ethyl alcohol in a 20 ml glass tube and then identified by using morphological characteristics according to several diagnostic keys (Levi & Levi, 2014; Platnick, 2005; Jocqué & Dippenaar-Schoeman, 2006; Foelix, 2011; World Spider Catalog, 2022). Specimens were examined and identified by a compound microscope with a lens (10x) and a dissecting microscope with a lens (20x), taking pictures by using a camera with a resolution of 10 pixels (Noori & Al-Azawi, 2022; Noori & Al-Azawi, 2023).

Results and Discussion

Morphological Characters: Eyes of the family Theridiidae are small and separated into three regions, anterior median eyes (AME) posterior median eyes (PME), and lateral eyes (LE). Anterior median eyes are not larger than posterior median eyes, and the inter distances are also equidistant, tarsi IV with a ventral comb of serrated hairs and legs with three claws. (Knoflach & Harten ,2002; Noordijk, 2016).

Identification

They are generally distinguished by their (Plate 1,2), small bodies and long legs, and are characterized by the presence of a set of strongly curved comb spines. Females Latrodectus cinctus are larger than males; they have black color and a simple shiny body with a prominent white mark of varying lengths extending beyond. Spinners on the dorsal surface of the abdomen, and on the ventral surface of the abdomen are white, not colored red with two patterns of back hairs and long curved comb hairs on the side edges of the wrist, and the fourth legs, in addition, the most important female reproductive structures are shaped like a dumbbell and the number of turns of its channels epigynum broad oval and width is greater than its length, Prosoma comparably flat, opisthosoma globular and shiny. The total body length is about 5 - 10 mm, and the body is black color. The carapace is longer than it is wide. The cephalothorax is dark brown to black and smaller than the abdomen. The anterior median eyes are not larger than they can vary depending on factors such as the amount of venom injected, individual's posterior median eyes, and the inter-distances are also equidistant (Plate 3) black round or globular abdomen and a white stripe-like series triangle connected in the dorsal side of the abdomen and laterally, patterns of the abdomen vary in coloration white, yellow, orange, or red. The posterior area of the sternum is pointed. The legs and palps are dark brown to black. The legs have dark areas in their joints. The fourth leg is the longest, then the third is the shortest. The ventral side is black with a white area behind the epigynum. The anterior part of the epigyneum has teeth, but the posterior part is different as it consists of two chitins swelling cycles that are white and broader in the back. The anterior part is too long. Opisthosoma is always black with a white pattern, (Plate4), and spinnerets are white with cob webs or tangled webs. Habitat in dry and semi-dry fields under stones, old houses, and fields. It is widespread in South Europe and Central Asia. The female makes a web to catch the prey; webs are thin and strong silk threads that form an irregular three-dimensional network (Plate 5, 6). Egg sacs are spherical with smooth, silky surfaces and measure (8-12) mm. They are brown or yellow with a smooth surface and silky. The average egg sac is (100-250) eggs. (Plate 6). When nutrition is good, they hatch, or climatic conditions temperature and humidity. (Souri, et al., 2024; WSC, 2024)

Plate 1. Dorsal side of female Latrodectus cinctus

Plate 2. Ventral side of female Latrodectus cinctus

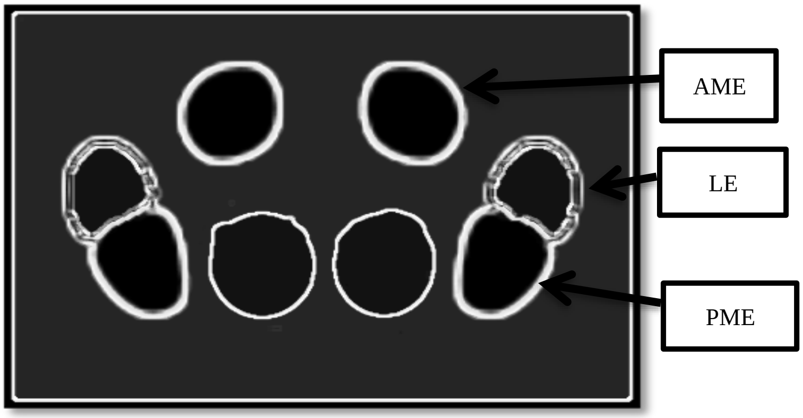

Plate 3. Eye pattern in female Latrodectus cinctus

Plate 4. Ventral View to Epigynum in female Latrodectus cinctus

Plate 5. Tangle web in female-female Latrodectus cinctus

Plate 6. Egg-sac with silk of female-female Latrodectus cinctus

Conclusions

This study intends to provide valuable insights into the ecology and public health implications of the Black Widow spider in Baghdad. The findings can inform future urban pest management programs and contribute to public health education initiatives. Environmental Benefits are: Pest Control: Black Widow spiders play a role in natural pest control by preying on insects such as flies, mosquitoes, cockroaches, and agricultural pests. Their predatory behavior helps regulate insect populations, reducing the need for chemical pesticides in agriculture and urban environments. Biodiversity: As a compoenent of the ecosystem, Black Widow spiders have to do with biodiversity by living at numerous niches within their habitats. Their existence can help in the diversity of arthropod communities and contributes to the overall balance of local ecosystems. Research: Black Widow spiders are scientifically interesting for their absolutely unique venom composition and neurotoxic effects. (Escoubas, *et al*. 2000) Studying these spiders can to higher extent give insights into venom evolution, neurobiology, and biomedical applications like the development of pain medications and antivenoms. Cultural Significance: In some cultures, Black Widow spiders hold symbolic or cultural significance, appearing in folklore, mythology, and artistic representations. Their presence in the natural world may inspire curiosity, wonder, and appreciation for biodiversity and ecological interactions. (Garb, *et al*.2004).

In conclusion, while Black Widow spiders are environmental hazardous and pose safety concerns for man, they also have ecological benefits, such as pest control, biodiversity support, scientific research opportunities, and cultural significance. Understanding the complex interactions between Black Widow spiders and their environment is good for promoting coexistence and sustainable management practices.

Author Contributions

All Authors contributed equally.

Conflict of Interest

The authors declared that no conflict of interest.

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