



Original Article

First Record of the Four-Spotted Oak Bug *Dryophilocoris flavoquadrimaculatus* (De Geer, 1773) (Hemiptera: Miridae) from Iraq

Banaz Sdiq Abdulla *¹

¹ Department of Biology, College of Education, Salahaddin University, Erbil 44001, Kurdistan Region, Iraq.

Received 24 February 2026; revised 22 July 2026;
accepted 29 July 2026; available online 10 August 2026

DOI: [10.24271/PSR.2026.577942.2629](https://doi.org/10.24271/PSR.2026.577942.2629)

ABSTRACT

For the first time, a detailed description of the four-spotted oak bug, *Dryophilocoris flavoquadrimaculatus* (De Geer, 1773) (Hemiptera: Miridae), is reported from Iraq. The species is identified by the following traits: Brown to dark brown labium has four segments extending to the procoxae. The fourth segment is spear-shaped and the longest, 1.2 times longer than the second. Four segments make up the filiform-shaped antenna, in which the third segment is 4.3 times longer than the second. Pronotum large, somewhat convex, with a black and yellow collisties. Forewings with four yellow corium spots. The inner margin of the fore tibia has two rows of short black spines; it is tubular, and 1.2 times as long as the femur. The right paramere has a serrated tip, is internally curved before the center, and is almost cylindrical in shape. With a bluntly terminated hypophysis and a claw-like sensory lobe, the left paramere is C-shaped.

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Keywords: *Dryophilocoris flavoquadrimaculatus*, Iraq, Miridae, New record.

1 Introduction

The plant bugs, family Miridae (Hemiptera: Heteroptera), are one of the largest and the most diverse families within the order Hemiptera, containing about 11,020 described species ^[1]. They are found in all major biogeographic regions of the world ^[2]. Historically, the family was referred to by the synonymous taxon Capsidae. Capsid bugs, leaf bugs, and grass bugs are other names for members of this family ^[3,4].

[5] and [6] stated that there are more than 10,000 recognized species in the family, which are divided into about 1,400 genera, and that new taxa are still being described. Numerous mirid species are important agricultural pests that can spread viral plant diseases and puncture plant tissues to feed on sap ^[3,7]. Their feeding frequently results in blossom blight or etiolation in host plants, resulting in significant economic losses in various crops ^[4,8]. Miridae are typically less than 12 mm in length, oval or elongate in shape, with four-segmented rostrums, no ocelli, a triangular cuneus on the forewing, two closed cells on the membranous portion, with coloration ranging from bright and elegantly patterned to drab or black ^[9,10,11]. Miridae species exhibit a variety of eating behaviors, such as omnivores, predation, and phytophagy ^[1,12,13,14,15]. *Dryophilocoris* Reuter,

1875, is an important genus of the Orthotylinae subfamily of the Miridae. Twelve species have been identified in this small Palearctic genus ^[16,17,18]. The genus is distinguished by several morphological characters including: an elongate, parallel-sided body, vertex with a basal transverse carina; eyes nearly contiguous with the pronotum, constricted anteriorly and divided into two lobes, and vesica with three sclerites ^[19]. Most species of the genus occur in northeastern Asia, with only three species known from Europe, they are primarily distributed throughout the temperate zones of eastern Eurasia and Japan ^[17,18, 20]. *Dryophilocoris flavoquadrimaculatus* (De Geer, 1773) is an ecologically important species because it helps control the numbers of common pests like aphids and other insects by acting as a predator ^[2]. It plays an important role in the food web in its ecosystem since it provides food for other species ^[21]. This species is characterized by, mostly black with yellow markings. short antennae, the posterior of the pronotum is strongly raised and the pronotum and forewings are covered with long fine erect hairs ^[2]. In Iraq, Miridae diversity has been investigated by several authors. ^[22] documented four species, ^[23] mentioned six species, ^[24] described 76 species belonging to the subfamily Phylinae and ^[25] later recorded three additional species.

The present study aims to collect mirid specimens by conducting a thorough survey of different places in Erbil Province, Kurdistan Region, Iraq. Provide a detailed description of the species morphology. Important diagnostic structures, especially the male genitalia, are documented and illustrated. Related ecological and

* Corresponding author

E-mail address banaz.abdulla@su.edu.krd (Instructor).

Peer-reviewed under the responsibility of the University of Garmian.

environmental information, such as host plants, locations, and dates of collection, should also be noted.

2 Methods and Materials

This study was carried out on 30 samples collected from the flowers of different weeds (plumeless thistle; hoary cress and dwarf rocket) between April and July of 2022 at several localities in Erbil Governorate (Qoshtappa, Kasnazan, Aski kalak, and Shaqlawa) in Kurdistan Region – Iraq. Initially, the collected samples were submerged in boiling water for ten to fifteen minutes to soften their body parts. The body was then dissected under a dissecting microscope into the head, thorax, and abdomen. To break down lipids and destroy muscle structures, the head and abdomen were positioned in a 10 ml beaker filled with 5 ml of 10% potassium hydroxide (KOH) and heated gently for ten to fifteen minutes while being constantly shaken. The treated portions were washed in distilled water for two to three minutes following maceration to neutralize any remaining alkali. The dissecting microscope was then used to examine them after they had been placed in 25% ethyl alcohol. For dehydration, the parts were passed successively through 50%, 75%, and 100% ethanol for two minutes in each concentration. To get translucency, the dehydrated portions were then submerged in xylol for two minutes. Lastly, a drop of DPX mounting media was used to mount the dissected pieces on glass slides, which were then covered with cover slides for microscopic inspection. Morphometric measurements of body parts were made using a linear micrometer attached to a binocular microscope following the procedures of [26] and [27]. The family was identified according to the taxonomic keys of [11, 28]. Species identification was performed using the available taxonomic keys of [29]. All the examined specimens are kept in the Insect Museum of the Plant Protection Department, College of Agricultural Engineering Sciences, Salahaddin University, Erbil, Iraq.

3 Results and Discussions

3.1 Description of *Dryophilocoris flavoquadrimaculatus* (De Geer, 1773)- four-spotted oak bug (male):

Body (Fig. 1a): Elongate, parallel-sided; soft, yellow with black color, dorsal surface with sparse golden pubescence; length 6.1–8.4 mm; width 1.5–2.4 mm.

Head: Black, nearly triangular. Length, 1.2–1.6 mm is as long as the width. Vertex black, each apical side of the basal transverse carina dark brown. Frons dark brown. Clypeus black, more prominent and vertical. Eyes black, nearly rounded, strongly prominent, the distance between the eyes is 0.4–0.6 mm. Ocelli absent. Labium (Fig. 1b) brown to dark brown, four-segmented, extending to procoxae, inserted ventrally on the head; long and tapering, length 3.0–3.6 mm., first segment elongate-oval, equal in length to the second segments, second and third segment filiform; second segment 1.3× longer than the third; fourth segment spear-shaped and the longest, 1.2× longer than the second and 1.8× longer than the third. Mandible (Fig. 1c) yellow, needle-shaped, length, 3.1–3.8 mm. Maxilla (Fig. 1d) is yellow,

needle-shaped, and equal in length to the mandible. Maxillary and labial palpi are completely absent. Antenna (Fig. 1e) brown-dark brown, slender, filiform, composed of four antennomeres, length 4.3–5.0 mm, first and second antennomeres are brown, third and fourth antennomeres are dark brown, first antennomere is the shortest; third antennomere is the longest, 4.3× longer than the second and 1.8× longer than the fourth. Posteriorly, the head forms a long, black neck that inserts into the pronotum.

Thorax: Pronotum (Fig. 1f) black, trapezoidal, glabrous on the posterior half, with a yellow posterior angle; length 2.2–2.7 mm, width equal to length, the lateral anterior margin is straight, while the posterior margin is somewhat concave, pronotum collistest yellow, very large and strongly convex. Scutellum yellow, triangular, with one-third of the apical parts are dark brown. Foreleg (Fig. 1i) brown; forecoxa conical, dark brown; trochanter two-segmented, upper one small and oval, lower one triangular; femur tubular, densely clothed with short black setae; tibia tubular, narrower, 1.2× longer than the femur, inner margin with short black spines arranged in two rows, dorsal margin has several short black spines in a row, apical margin with tuft of dark brown spines. Protarsus three-segmented, dark brown; first segment 1.2 times longer than second; third segment 1.3× longer than the first; claw simple, dark brown, hook-shaped. Ventral surface of claw with small pulvili. Middle legs are similar to forelegs. Hind legs similar, except metacoxa conical, slightly expanded. Forewing (Fig. 1g) hemelytron is glassy, translucent, brownish yellow, with four main veins. Length 4.4–5.6 mm. Costal vein slightly convex, extending from base to cuneus; radius vein slightly convex, unbranched, ending near apex of cuneus; median vein unbranched, extending from base to near base of membrane; cubitus vein straight, unbranched, reaching posterior margin, the wing is divided into corium, triangular, yellow with central dark brown area, cuneus yellow, triangular, and clavus dark brown, nearly triangular. Hind wing (Fig. 1h) membranous, pale brown, triangular; length 5.2–6.0 mm; veins brown; oblong discal cell large and oval, 2.5–3.0 mm long; veins R_{4+5} slightly curved, ending near apical margin; veins M slightly curved, ending at the middle region; veins Cu straight, ending at posterior margin; Anal vein (A1) ends at the middle part of posterior region. Vannal fold present; crossvein (h) moderately curved, short; crossvein (r–m) straight, short.

Abdomen: Oval, yellow, with black lateral margins; composed of eight visible segments. Abdominal sternites I–VII transverse; second sternite 1.1× longer than the first and 1.3× longer than the third; third and fourth sternites equal; fifth sternite 1.1× longer than the sixth; seventh sternite 1.1× longer than the sixth. Eighth sternite dark brown, strongly sclerotized, nearly cup-shaped, with moderate yellow setation. Abdominal tergites I–VIII are visible; I–VII tergites transverse, nearly rectangular, black; VIII tergite nearly cup-shaped, yellow. First abdominal tergite 1.1× as long as second; third tergites 1.3 times longer than the fourth; fourth and fifth tergites subequal; eighth tergites 2.3× longer than the seventh. Eighth tergite cup-shaped, yellow, with small black lateral spots.

Male genitalia: Pygophore, brown, trapezoidal shaped, strongly excavated at the ventral surface, length 1.5–1.9 mm. Aedeagus

(Fig. 1j) brown-dark brown, slightly curved, length 1.0-1.5 mm; phallosome simple, nearly cylindrical, dorsally open near middle, margins distally contiguous, sipiculum short, highly sclerotized and hook shaped; right paramere (Fig. 1k) nearly cylindrical shaped, height sclerotized, slightly tapering to apex, inwardly bent before middle, and with a toothed apex, length, 0.4-0.6 mm; left paramere (Fig. 1l) height sclerotized, C-shaped with claw-

like sensory lobe and bluntly ended hypophysis, length similar to the right paramere.

Female genitalia: Large-sized; brown-dark brown, ovipositor (Fig. 1m) elongate, with sharp, saw-edged valvula, length 2.7-3.2mm; interramal lobe developed, spinulate on its entire surface.



Figure 1: *Dryophilocoris flavoquadrinotatus*. a. Habitus (6X) b. Labium c. Mandible d. Maxilla e. Antenna f. Pronotum g. Scutellum h. Hemelytra i. Hind wing j. Fore leg k. Aedeagus l. Right paramere m. Left paramere n. Ovipositor; scale bars; b, c, d, e, f, g, h, i, m=2mm; j, k, l=0.5mm.

5 Conclusion

The Miridae, often known as "mirid bugs" or capsid bugs, are a large and diverse family of Hemiptera insects. Grass bugs, leaf bugs, and plant bugs are some common names. The most well-known types of mirids are notorious agricultural pests that occasionally carry viral plant diseases, penetrate plant tissues, and eat sap.

However, some species are predatory. Numerous mirid species are infamous agricultural pests that can spread viral plant diseases and puncture plant tissues to feed on sap. In some crops, their feeding frequently results in etiolation or blossom blight in host plants, which causes significant economic losses. Consequently, a thorough examination of Iraq's many locations is necessary to collect samples and update the database for the family Miridae.

Acknowledgements

I would like to express my sincere gratitude to Salahaddin University and Prof. Dr. Nabeel A. Mawlood, College of Agricultural Engineering Sciences, Salahaddin University, for his continuous support, worthwhile advice, and kind help verifying the identification of the species level. His constructive comments and careful reading of the manuscript are deeply appreciated. I also wish to extend my thanks to Dr. Hanna Al-Safar of the University of Baghdad, Iraq Natural History Research Center and Museum, for her invaluable assistance in verifying the species identification and for her scientific cooperation throughout this work. The author expresses his appreciation for their continuous assistance offered by Salahaddin University-Erbil during this work.

Author Contributions

BSA created the study's concept and design, carried out the experiments, examined the results, and composed the manuscript. The manuscript's final version was approved by the author.

Conflict of interest

The author declares no conflicts of interest.

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