

## First Report of Polymorphism of *Hippodamia variegata* (Goeze) (Coleoptera:Coccinellidae) in the Coastal Area of Syria (Latakia Governorate)

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### Abstract

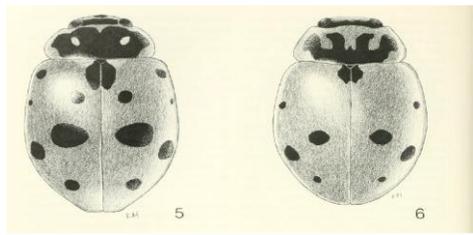
In this study, various morphological patterns of *Hippodamia variegata* (Goeze, 1777) (Coleoptera: Coccinellidae) were identified. Adult specimens were collected from various places of the Syrian coastal area, in Latakia governorate, and reared in the laboratory at different temperatures (15, 20, 25, 30 and 35)°C during the period 2014-2016. Different colorations were noted in various forms on the elytron. The number of patches located on the elytron was variable and ranged from 3 to 7 spots. Depending on the number, size and shape of these spots, 37 morphs of *H. variegata* were identified.

**Key words:** Coleoptera, Coccinellidae, *Hippodamia variegata*, Latakia, Polymorphism, Syria.

### Introduction:

Many ladybird species (Coccinellidae) exhibit a remarkable variability of elytron color patterns within the same species, such as *Cheilomenes sexmaculata* (Fabricius) (Singh *et al.*, 2016; Kawakami *et al.*, 2015b), *Harmonia axyridis* Pallas (Tan, 1945), *Adalia bipunctata* Mulsant (Zare *et al.*, 2012), *Coelophora quadrivittata* Fauvel (Chazeau, 1980) and *Hippodamia variegata* (Honek *et al.*, 2012a). The polymorphism of numerous coccinellids species had been investigated extensively. The correlation between color and each of chance of survival during hibernation (*Adalia bipunctata*) (Brakefield, 1984), activity levels at different temperatures (*A. bipunctata*) (Jong and Brakefield, 1998), reproductive success (*H. axyridis*) (Wang *et al.*, 2009), and environmental pollution has been investigated and described by a number of scientists (Brakefield and Lees, 1987). Recent theoretical and empirical developments suggest that geographic variation in the number, type and frequency of morphs present among populations can increase the probability of speciation. Thus, the geographical context of a polymorphism requires a greater research focus. The prevalence and nature of geographic variation in polymorphism suggests that polymorphism may be a precursor to and facilitate speciation more commonly than appreciated previously (McLean and Stuart-Fox, 2014). "*Hippodamia variegata* (Goeze, 1777) (Coleoptera: Coccinellidae) is characterized by a base of pronotum with fine marginal

bead, head yellow with black vertex (male) or yellow with vertex and large frontal black spot (female), pronotum black with anterior, lateral borders, small spot on each side (female) or with anterior border of black area deeply emarginate medially with yellow spot on each side broadly connected to yellow anterior border (male)" (Gordon and Vandenberg, 1991) (Fig. 1).



(Gordon and Vandenberg, 1991)



(Makhlouf *et al.*, 2016)

**Figure 1. Male and Female of the species *Hippodamia variegata***

### Materials and Methods:

Adult specimens were collected from various areas of the Syrian coast (Lattakia governorate) and were reared in the laboratory at different temperatures (15, 20, 25, 30 and 35)°C. With continuous rearing of this predator, 3 generations were produced within 3 months.

### Results:

The ladybird beetle *H. variegata* has thirty seven elytron color morphs (Fig. 2). Adults of *H. variegata* were collected during the period 2014 - 2016 from Tobacco leaves. These morphs differ by number, size and shape of spots on elytra, and from these patterns, 9 are characterized by 4 patches on the elytra, 11 are characterized by 5 patches on the elytra, 13 are characterized by 6 patches on the elytra, 2 are characterized by 3 patches on the elytra and 2 are characterized by 7 patches on the elytra.

### Discussion:

The reason behind this polymorphism may be due to different temperatures. As the temperature increases, the size of the spots decreases gradually until some spots do not develop at high temperatures. In addition, the polymorphism may be due to a genetic variation (Hodek *et al.*, 2012). During 1937 to 2011, 22 different morphs of *H. variegata* were reported from the central part of Europe and Slovakia (Honek *et al.*, 2012a). Biranvand *et al.*, (2013a) found 12 morphs of *H. variegata* in Lorestan Province in Iran. In another study, a total of 18 different morphs of *H. variegata* were collected and identified in Iran (Biranvand and Shakarami, 2015a). Four different morphs of *H. variegata* were identified and confirmed in central region of Iran (Khormizi *et al.*, 2013b). Recently, there has been a surge of interest in the role of polymorphism in speciation (Gray and McKinnon, 2006), with recent evidence linking polymorphism to rapid phenotypic evolution (Corl *et al.*, 2010). Polyphenism is the phenomenon where two or more distinct phenotypes are produced by the same genotype. Polyphenisms are a major reason for the success of the insects to adopt different phenotypes that best suit predictable environmental changes (seasonal morphs), to cope with temporally heterogeneous environments (dispersal morphs), and to partition labour within social groups (the castes of eusocial insects) (Simpson *et al.*, 2011). *Hippodamia variegata* has several morphs that are different at the margins, size and number of points on elytra. The denominator which is existent in all morphs is the apical spot constant on apical angle of elytra. This denominator is identified in all previous studies. These results are primary since they require histological and genetic studies to determine the

morphogenetic effects. The genetic control of the inherited traits in geographically separated populations is expected to differ due to various effects of evolutionary influences (Honek *et al.*, 2012b). This species has many forms and requires genetic studies that determine the morphological effects. Genetic composition is expected to vary and this may lead to the emergence of new species.



**Figure 2. Different Morphs of *Hippodamia variegata***

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التسجيل الأول لظاهرة تعدد الأشكال للنوع *Hippodamia variegata* (Goeze) (Coleoptera:Coccinellidae) في منطقة الساحل السوري (محافظة اللاذقية)

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### الملخص

في هذه الدراسة، لوحظ أنّ للنوع *Hippodamia variegata* (Goeze) (Coleoptera:Coccinellidae) أنماط شكلية متعدّدة. تمّ جمع البالغات من مناطق مختلفة من الساحل السوري بمحافظة اللاذقية، وتمتّ التربية المخبرية على درجات حرارة مختلفة (15، 20، 25، 30، و35)م خلال الفترة الممتدة ما بين عامي 2014 - 2016. اختلفت أعداد البقع المتواجدة على الجناح الغمدي، حيث تراوحت ما بين 3 - 7 بقعة. اعتماداً على عدد وحجم وشكل هذه البقع، تمّ تحديد 37 نمطاً شكلياً للنوع *H. variegata*.  
 الكلمات المفتاحية: *Hippodamia variegata*, Coleoptera, Coccinellidae، الأنماط الشكلية، Polymorphism، محافظة اللاذقية، سورية.