



A new pest of *Gossypium hirsutum* in Turkey: *Leptodemus minutus* Jakovlev 1876 (Hemiptera: Heteroptera: Lygaeidae: Oxycareninae)

Türkiye’de Pamukta yeni bir zararlı: *Leptodemus minutus* Jakovlev 1876 (Hemiptera: Lygaeidae: Oxycareninae)

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ÖZET / ABSTRACT

Aims: Presence of *Leptodemus minutus* Jakovlev (Hemiptera), which cause direct damage by feeding, was investigated on cotton crop plants in Hatay province, Turkey.

Methods and Results: The study material was constituted from specimens of *L. minutus* Jakovlev collected from cotton plants growing in Hatay in 2019. In this study, specimens were prepared for re-description for species level, the body parts of examined species having taxonomical importance were photographed. In addition, distributional data of the species in Turkey and on the world, host plants and collection locality information for each of the species investigated were given. Important morphological characters of species were examined.

Conclusions: Cotton is currently the leading fiber plant crop in worldwide. There are many harmful insect in cotton production, which cause economic losses. In recent years, *Leptodemus minutus* Jakovlev as a new pest of cotton, which causes serious damage to the cotton production has emerged. The pest has been reported first time in cotton production areas of Hatay province of Turkey in 2019.

Significance and Impact of the Study: This pest causes damage on young seedlings by colonizing in high numbers and feeds by inserting its stylets into the leaves and stems causing deformation of the leaves and wilting. Pest control is difficult due to the high population and there are not enough studies on integrated pest control. This study clearly shows that there is a need for a detailed study on the biology and control of the pest at cotton-cultivated areas.

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INTRODUCTION

The genus *Gossypium* was named by Linneaus in the middle of the 18th century. It is in the Order Malvales and Tribe Gossypieae, Family Malvaceae (Smith, 1995). Cotton plant is one of the most important cash crops cultivated globally in several countries. It is grown

commercially in more than 50 countries which are in the temperate and tropical regions (Smith, 1999). It provides raw material for cotton textile industry and also is the source for edible oil. There are few countries in the world which have suitable ecological conditions and produce 80% of world production among which Turkey is counted. An average of 32.1 million hectares of cotton is

cultivated in the world and 24.4 million tons of fiber cotton is obtained from this planting area (Customs and Trade Ministry, 2018). While India, China, Pakistan, USA and Uzbekistan are the leading cotton growing countries of the World (Tidke et al., 2014), according to 2017/18 season forecasts, the top 5 cotton producing countries in the world are; India, China, USA, Pakistan and Brazil. The top five consumer countries are China, India, Pakistan, Bangladesh and Turkey (Customs and Trade Ministry, 2018).

Cotton cultivation has a significant potential and there are many disease agents and pest species that restrict production which may affect negatively the cotton cultivation in Turkey, many species to be harmful such as *Aphis gossypii* Glov. (Hemiptera: Aphididae), *Thrips tabaci* L. (Thysanoptera: Thripidae), *Empoasca decipiens* Paoli, *Asymmetrasca decedens* (Paoli) (Hemiptera: Cicadellidae), *Tetranychus cinnabarinus* (Boisd.), *T. urticae* (Acarina: Tetranychidae), *Bemisia tabaci* (Hemiptera: Aleyrodidae) *Oxycarenus hyalinipennis* (A. Costa), *O. luctuosus*, *Nysius vinitor* (Hemiptera: Lygaeidae), *Creontiades pallidus* (Rumb.), *Lygus italicus* Wagner (Hemiptera: Miridae), *Nezara viridula* (L.) (Hemiptera: Pentatomidae), *Heliothis armigera*, *Spodoptera littoralis* (Boisd.) (Lepidoptera: Noctuidae), *Pectinophora gossypiella* (Saund.) (Lepidoptera: Gelechiidae) (Tezcan, 2000; Efil and İlkan, 2003; Mart, 2004; El-Wakeil and Abdallah, 2012; Özgür et al., 2019) are among the important sucking pests. Recently, *L. minutus*, has emerged as a new pest of cotton in Turkey. The family Lygaeidae to which *Leptodemus minutus* is belonged to is one of the richest family after the Miridae of the order Hemiptera. The family includes some 650 genera and about 4000 species, distributed in almost all habitable lands of the world (Aukema and Rieger, 2001). *L. minutus* from the Oxycarininae subfamily is widely distributed in the southernmost area of the Palearctic region, extending to Sudan (Péricart, 2001). Number of

European localities (in Spanish) are very few (Goula et al., 2008). Two species belonging to the genus *Leptodemus* in the Palearctic region, the presence of a one species in Turkey is known (Aukema and Rieger, 2001). *Leptodemus minutus* lives on sandy soils, in desert climates (Péricart, 2001). It may also be collected at 4000 m (Atlas range, Morocco). It is speculated that maybe it frequents dry and sunny places, where grasses are abundant, as wasted lands, field margins, road and trail borders, among others (Goula et al., 2008).

In 2019, *L. minutus* that a new pest of cotton which causes serious damage to the cotton production area has emerged in Hatay, Turkey. In this contribution, we report *L. minutus* as a pest of cotton in Turkey, and comment on the taxonomy of the species.

MATERIALS and METHODS

The study material was constituted from specimens of *L. minutus* which collected from Hatay in 2019 (Fig. 1). The material was obtained from cotton. In this study, specimens were prepared for re-description for species level, the body parts of examined species having taxonomical importance were photographed. In addition, distributional data of the species in Turkey and on the world, host plants and collection locality information for each of the species investigated were given. Important morphological characters of species were examined. The specimens were dissected for examination, and abdomens were removed and placed in a cold 10% KOH solution for 10 minutes. Then the important terminal parts showing taxonomic characters of the species were removed from the abdomen. Photos enhanced using Corel PHOTO-PAINT software (version 12.0). Morphological characters given in this paper are according to Çağatay (1985). The material deposited in the Nazife Tuatay Plant Protection Museum (Ankara).



Figure 1. Sampling site of *Leptodemus minutus*

RESULTS and DISCUSSION

Material examined

Hatay: Altınözü, Hacıpaşa, 124m, 36°00'45.4"N 36°21'23.7"E, 18.V.2019, 12 ♀♀, 28 ♂♂.

Distribution in Turkey

Afyonkarahisar (Sert et al., 2013); Isparta, Manisa, İzmir, Şanlıurfa (Çağatay, 1985); Gaziantep, Kahramanmaraş, Kilis (Lodos et al., 1978, 1999); Siirt (Matocq and Özgen, 2010; Matocq et al., 2014). Önder et al. (2006) reported the species from Ege, Marmara and Mediterranean regions.

Distribution

Egypt (Linnavuori, 1964); Libya (Gentry, 1965; El-Meghrabi, 2009); Sudan (Linnavuori, 1977); Iraq (Linnavuori, 1995); Jordan (Tawfiq, 1990; Katbeh et al., 2000); Russia, Ukraine, Algeria, Morocco, Tunisia, Azerbaijan, Afghanistan, Kazakshtan, Turkey, Cyprus, Israel, Kirgizia, Kuwait, Mongolia, Saudi Arabia, , Syria, Tadjikistan, Turkmenistan, Uzbekistan, Yemen, (Aukema and Rieger, 2001); Canary Islands (Heiss et al., 1996; Aukema et al., 2006); Spain (Goula et al., 2008); Iran (Linnavuori, 2011); Kazakhstan (Yesenbekova and Homziak, 2013).

Morphology and Identification

Leptodemus minutus has been described by Jakovlev (1876) from Astrakhan. The series-type (9 syntypes) is preserved at the Institute of Zoology of Saint-Petersburg. This species was transferred to the genus *Leptodemus* by Reuter (1900) and is the standard species. It has a large area of contemporary distribution, from Algeria to

Turkey and to Middle Asia. It is highly variable in color, and several "varieties" have been described: *albicans* Reuter op. cit. (Turkmenistan), *pallidula* Reuter op. cit. (Algeria), *mancinii* Stichel 1958: 144 (provenance) (Péricart, 1994). In this study microscopic observations for a correct identification in *L. minutus*, were conducted. It is as follows.

1 (2) Head as wide or wider than long; body 3.5-3.7 times as long as the width of the pronotum. First article of posterior tarsi longer than the next 2. Long: 2.5-3.6 mm. Turanian-SudMediterranean

element..... *L. minutus* (Jakovlev)

2 (1) Head longer than broad; body 4.2-4.4 times as long as the width of the pronotum. First article of posterior tarsi a little shorter than the next 2. Long: 2.8-3.0 mm. Turanian-Mediterranean

element.....*L. bicolor* Lindberg

Leptodemus minutus Jakovlev 1876

Synonymy: *Macropterna minutus* Jakovlev, 1874

Head, distal of pronotum, thorax light yellow-brown and other parts of the body cream; membrane white, veins pale brown; Pygophore very light colored and quite different shaped, distal straight, lateral edges very light arc-shaped; the genital patency is the same width as the pygophore in the distal, and "V" shaped in the proximal (Fig. 2 B); Although three slight protrusions are generally chosen at the edges of the genital opening showing the "V" shape, the anterior and posterior segmentation seen in the general structure of Lygaeidae pygophore is not apparent in this species; the hypophysis part of the paramers is narrow curved and pointed; the body has a large angled outer protrusion, a rounded front protrusion and protrudes proximally (Fig. 2 C,D). Body height: 2,6-3,4 mm.

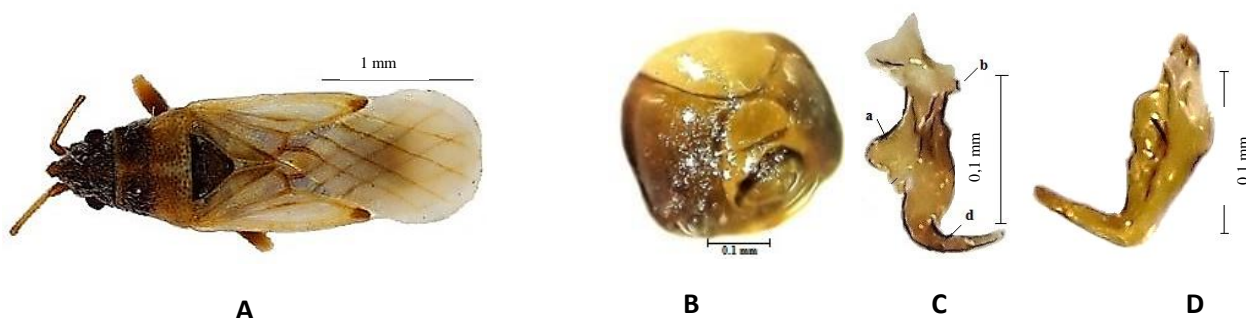


Figure 2. A: Adult of *Leptodemus minutus* Jakovlev ♂; B: Dorsal view of the genital capsule; C- Left paramere (a: outer protrusion, b: basal protrusion, c: front protrusion, d: hypophysis); D-Right paramere

Habitat and Ecology

Leptodemus minutus lives on sandy soils, in desert climates. It may also be collected at 4000 m (Atlas range,

Morocco) (Goula et al., 2008), in Tenerife on the Teyde peak up to 3700 m, in Middle Asia up to 2400 m. It seems to hibernate as an adult and perhaps a larva. Hibernants

are found under the surface layer of sand at the foot of plants or among their residues, it has also been found in a Rodent burrow. Active adults meet from early spring to late fall; larvae at stages III-V could collected even in the middle of July. The species could be polyphagous. It has also been mentioned among insects harmful to vineyards in Algeria, but this does not seem to have been confirmed subsequently (Péricart, 1998). As host plants, *Artemisia inodora*, *Plantago indica* and *Aristida scoparia* have been recorded (Goula et al., 2008). Besides, olive, orange (Gentry, 1965), Poaceae (Linnavuori, 2011), *Polygonum equisetiforme* L. (Parkinson et al., 1923), fig, pear, apple, peach, pistachio, grape, cereals, cabbage, cauliflower, muskmelon, weeds (Tawfiq, 1990) and *Salix* sp. have been reported (Lodos et al., 1978, 1999; Kıyak, 2019). It is speculated that maybe it frequents dry and sunny places, where grasses are abundant, as wasted lands, field margins, road and trail borders, among others (Goula et al., 2008).

Damage

Lygaeidae that feed on fallen weed seed may beneficially prevent germination. The observation that *L. minutus* sucks human blood was dismissed as random exploration for moisture (Slater, 1972). This probably also applies to *Macropternella inermis* (Fieber), and to *Nysius* swarms in Sudan and Kuwait, where specimens inflicted painful bites and swellings on exposed parts of the human body (Judd, 1994). *Leptodemus minustus* has been observed in cotton fields in May of the year 2019 in Hatay. In hot and dry periods, weather conditions favorable for the development of large populations, individuals of the species feed on plant tissue and cause chlorosis in the leaves and scarification on the fruits, which become deformed and whitish to silver-colored.

Control

Leptodemus minutus is a potential threat for cotton production areas in Turkey. In Hatay province, which has an important place in terms of cotton production area and production amount, it is not known exactly the distribution and damage of the pest. The pest is not yet sufficiently recognized by the cotton growers and can be confused with other pests according to symptoms. Due to their small size and ability to move quickly, controlling by conventional chemical means is difficult and also there are not enough studies on integrated control. According to the available literature, it is the first pest report of *L. minutus* on cotton in the World. There is a need to carry out studies on hosts, prevalence in cotton fields, biology, natural enemies and damage to cotton yield of *L. minutus*.

ÖZET

Amaç: Bu çalışmada, pamuk bitkileri üzerinde beslenerek doğrudan zarara yol açan *Leptodemus minutus* Jakovlev (Hemiptera)'un Hatay ilindeki varlığı araştırılmıştır.

Yöntem ve Bulgular: Çalışma materyali 2019 yılında Hatay'dan toplanan *L. minutus* Jakovlev örneklerinden oluşturuldu. Böcek örnekleri pamuktan elde edildi. Çalışmada, türlerin yeniden tanımlanması için örnekler hazır hale getirilmiş, incelenen türlerin taksonomik önemi olan vücut kısımları fotoğraflanmıştır. Ayrıca Türkiye'de ve dünyada türlerin dağılım verileri, konukçu bitkiler ve incelenen türlerin her biri için toplama yer bilgisi verilmiştir. Türlerin önemli morfolojik özellikleri incelenmiştir.

Genel Yorum: Pamuk günümüzde yetiştiriciliği yapılan önde gelen lifli bitkilerdendir. Ilıman ve tropik bölgelerde 50'den fazla ülkede ticari olarak yetiştirilmektedir. Pamuk üretiminde önemli ekonomik zararlara neden olan birçok zararlı bilinmektedir. Son yıllarda pamuk üretiminde zararlara neden olan yeni bir pamuk zararlısı *L. minutus* ortaya çıkmıştır. Bu zararlı ilk olarak 2019 yılında Hatay'da pamuk alanlarından bildirilmiştir.

Çalışmanın Önemi ve Etkisi: Bu zararlı Oxycareninae (Hemiptera: Lygaeidae) altfamilyasına aittir ve genç fidelerde yüksek miktarlarda kolonileşerek, yapraklar üzerinde yoğun bir şekilde emgi yaparak, yaprakların solmasına ve deformasyonuna neden olur. Zararlı ile mücadele yüksek popülasyon nedeni ile zordur ve Entegre mücadele amaçlı zararlıyla ilgili yeteri kadar çalışma bulunmamaktadır. Bu çalışma, pamuk üretim alanlarındaki zararlıların biyolojisi ve kontrolü ile ilgili ayrıntılı çalışmaya ihtiyaç olduğunu göstermektedir.

Anahtar Kelimeler: *Gossypium hirsutum*, *Leptodemus minutus*, Heteroptera, Lygaeidae, Oxycareninae, Türkiye.

CONFLICT OF INTEREST

The authors declare no conflict of interest for this study.

AUTHOR'S CONTRIBUTIONS

The contribution of the authors is equal.

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