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ARAŞTIRMA MAKALESİ **RESEARCH ARTICLE**

Evaluation of seasonal population fluctuation of plants bugs (Hemiptera: Miridae) on cotton plants of Amik Plain

Amik Ovasındaki pamuk bitkilerinde bitki tahtakurularının (Hemiptera: Miridae) mevsimsel popülasyon dalgalanmalarının değerlendirilmesi

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Ö Z E T / A B S T R A C T

Aims: Evaluation of seasonal population fluctuation of plants bugs (*Lygus gemellatus* (HerrichSchäffer), *Lygus pratensis* Linnaeus, and *Creontiades pallidus* (Rambur) (Hemiptera: Miridae) on cotton plants of Amik Plain.
Methods and Results: The studies were carried out at fifty cotton fields located in Kırıkhan, Reyhanlı, Kumlu, Demirköprü and Uydukent districts of Amik Plain in Hatay province. Each of district contained 10 different cotton fields. The samplings were weekly taking by using a 45-cm diameter sweep-net, taking 25 (back-forth) sweep samples per site. The adults and nymphs of plant bugs were sorted out from plants materials, counted and recorded for each of the sampling locality and cotton field. A total of 1855 of plant bugs were caught by sweep-net at five (fifty cotton fields) sampled districts. The largest number of plants bugs were recorded in Demirköprü, followed by Reyhanlı, Uydukent, Kumlu and Kırıkhan. In addition, the highest mean of plant bugs were recorded on 8 October comparing to others sampling dates. Moreover, the largest amount of plants bugs were recorded in September, followed in October, August and July. In general, population density of plant bugs in Demirköprü, Reyhanlı, Uydukent and Kumlu districts were significantly higher than in Kırıkhan district.
Conclusions: The highest number of plants bugs (*Lygus gemellatus* (HerrichSchäffer), *Lygus pratensis* Linnaeus, and *Creontiades pallidus* (Rambur) were recorded in Demirköprü, followed by Reyhanlı, Uydukent, Kumlu and Kırıkhan districts. Moreover, the largest number of plants bugs were recorded in September, followed in October, August and July.
Significance and Impact of the Study: A total of 1855 of plant bugs were caught by sweep-net at five sampled districts. The highest number of plants bugs were recorded in Demirköprü, followed by Reyhanlı, Uydukent, Kumlu and Kırıkhan districts. Moreover, the largest amount of plants bugs were recorded in September, followed in October, August and July. In general, population density of plant bugs in Demirköprü, Reyhanlı, Uydukent and Kumlu districts were significantly higher than in Kırıkhan district.

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INTRODUCTION

Cotton is one of the most important industrial crops that infested with different kinds of insects in its production cycle. The main cotton pests in Turkey were identified as: *Aphis gossypii* Glov., *Empoasca decipiens* Paoli, *Asymmetrasca decedens* (Paoli), *Bemisia tabaci* Gennadius, *Creontiades pallidus* (Rambur), *Lygus gemellatus* (HerrichSchäffer), *Lygus pratensis* Linnaeus, *Frankliniella intonsa* Trybom, *Helicoverpa armigera* (Hübn.), *Earias insulana* Boisd., *Spodoptera exigua* (Hübn.), *Spodoptera littoralis* (Boisd.), *Tetranychus cinnabarinus* (Boisd.), *T. urticae* Koch., and *Thrips tabaci* Lind (Karsavuran, 2004; Önder et al., 2006). Miridae species, commonly known as plant bugs or Capsids, includes important pests of cultivated plants (Kelton, 1975; Pedigo, 1999; Wheeler, 2001; Capinera, 2002; Jay et al., 2004; Demirel et al., 2005; Cranshaw and Demirel, 2006; Demirel and Cranshaw, 2006; Önder et al., 2006; Demirel and Cranshaw, 2007; Demirel, 2009). There are approximately 10,000 Miridae species in the world (Schuh and Slater, 1995; Schuh, 1995; Wheeler, 2000) and 559 of them were described in Turkey (Önder et al., 2006). The species of *Lygus lineolaris* (Palisot de Beauvois), *Lygus hesperus* Knight, *Lygus elisus* Van Duzee and *Lygus desertinus* Knight are well-known species in North America (Kelton, 1975; Gerber and Wise, 1995; Schuh and Slater, 1995; Schuh, 1995; Pedigo, 1999; Nordlund, 2000; Wheeler, 2001; Capinera, 2002). The species of *Lygus rugulipennis* (Poppius, 1911), *Lygus pratensis* (L.), *Lygus gemellatus* (HerrichSchäffer) and *Adelphocoris lineolatus* (Goeze, 1778) are widely distributed on a large diversity of host plants in Europe (Holopainen and Varis, 1991; Jay et al., 2004). In addition, the species of *Lygus rugulipennis* Poppius, *Lygus lineolaris*, *Lygus borealis* Kelton*, Lygus elisus* Van Duzee, *Lyggus hesperus* Knight, *Lygus kalmi* L., *Adelphocoris linealatus* Goeze, *Lygus lucorum* Meyer-Dür, *Creontiades pallidus* Rambur, *Exolygus gemellatus* H.S., *Exolygus pratensis* L., *Apolygus lucorum* (Meyer-Dür) are found in Turkey (Önder et al., 2006; Demirel, 2009). Mirids species suck leaves, shoots, squares (floral buds), flowers and young bolls of cotton and cause damage of drying and shedding (Kelton, 1975; Tugwell et al., 1976; Hanny et al., 1977; Pedigo, 1999; Holman and Oosterhuis, 1999; Layton, 2000; Teague et al., 2001; 2002; Wheeler, 2001; Efil and İlkan, 2003; Karsavuran, 2004; Rosentheim et al., 2004; Efil and Bayram, 2009). The purpose of this study was to evaluate of seasonal population fluctuation of plants bugs *Lygus gemellatus* (HerrichSchäffer), *Lygus pratensis* Linnaeus, and *Creontiades pallidus* (Rambur) (Hemiptera: Miridae) on cotton plants of Amik Plain.

MATERIALS and METHODS

The studies were carried out at fifty cotton fields located in Kırıkhan, Reyhanlı, Kumlu, Demirköprü and Uydukent districts of Amik Plain in Hatay province. Each of district contained 10 different cotton fields and taking from 30 June to 15 October in 2009. The samplings were weekly taking by using a 45-cm diameter sweep-net, taking 25 (back-forth) sweep samples per site. All samples were done by the same person, usually a straight line transect across the sample site. Samples were immediately placed into (0.5 L) plastic cups containing 96% ethyl alchol and returned to the lab for evaluation. The adults and nymphs of plant bugs (*Lygus gemellatus* (HerrichSchäffer), Lygus pratensis Linnaeus, and *Creontiades pallidus* (Rambur)) were sorted out from plants materials, counted and recorded for each of the sampling locality and cotton field. All data were analyzed by analysis of variance (ANOVA) with using the SAS software (SAS Institute Inc., 1990).

RESULTS and DISCUSSION

A seasonal population fluctuation of plants bugs gradually varied on cotton plants during the sampling periods in Kırıkhan district. A total of 188 plants bugs were caught by sweep-net (Figure 1). The largest mean of catches by sweep-net were recorded on 17 September and 15 October (2.9), followed by 24 September (2.3), 1 October (2.2), 3 September (2.1) and 8 October (1.8), respectively. The highest number of catches by sweep-net were recorded in September (77), followed in October (69), in August (32) and in July (2), respectively.

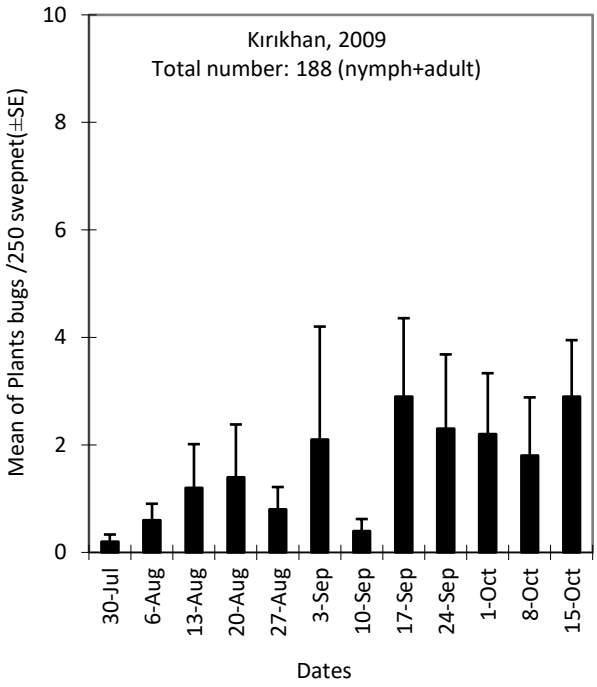

Figure 1. Mean (±SE) of plant bugs caught by sweep-net on cotton plant in Kırıkhan district

A seasonal population fluctuation of plants bugs gradually varied on cotton plants during the sampling periods in Reyhanlı district. A total of 413 plants bugs were caught by sweep-net (Figure 2). The largest mean of catches by sweep-net were recorded on 3 September (8.4), followed by 15 October (5.7), 1 October (5.3), 13 August (5.0), 24 September (4.9), 8 October (3.7), 17 September (2.7), respectively. The highest number of catches by sweep-net were recorded in September (177), followed in October (147), in August (91) and in July (4), respectively.

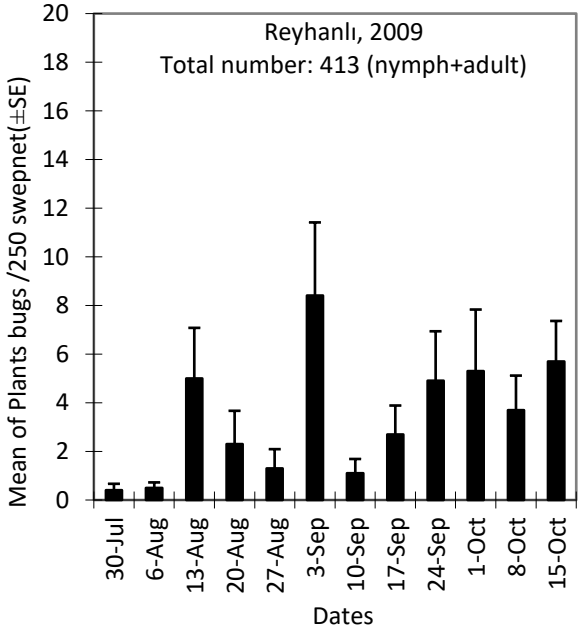

Figure 2. Mean (±SE) of plant bugs caught by sweep-net on cotton plant in Reyhanlı district

A seasonal population fluctuation of plants bugs gradually varied on cotton plants during the sampling periods in Kumlu district. A total of 330 plants bugs were caught by sweep-net (Figure 3). The largest mean of catches by sweep-net were recorded on 24 September (5.3), followed by 1 October (4.7), 3 September (4.4), 17

September (4.0), 8 October (3.9), 15 October (3.5), 10 September (2.8), respectively. The highest number of catches by sweep-net were recorded in September (165), followed in October (121), in August (37) and in July (7), respectively.

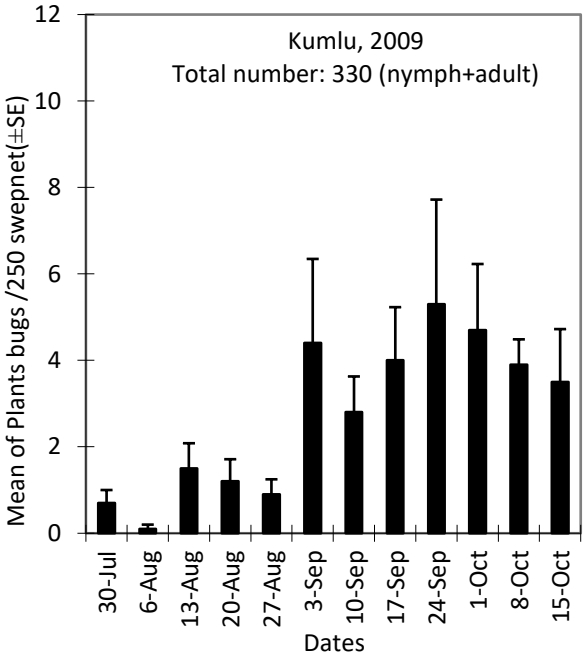

Figure 3. Mean (±SE) of plant bugs caught by sweep-net on cotton plant in Kumlu district

A seasonal population fluctuation of plants bugs gradually varied on cotton plants during the sampling periods in Demirköprü district. A total of 587 plants bugs were caught by sweep-net (Figure 4). The largest mean of catches by sweep-net were recorded on 8 October (11.7), followed by 24 September (9.8), 1 October (9.1), 17 September (7.7), 15 October (5.7), 10 September (4.6), 3 September (3.8), respectively. The highest number of catches by sweep-net were recorded in October (265), followed in September (259), in August (62) and in July (1), respectively.

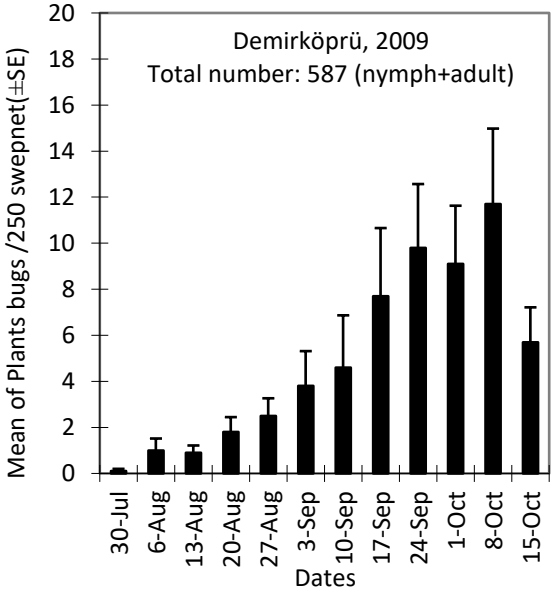

Figure 4. Mean (±SE) of plant bugs caught by sweep-net on cotton plant in Demirköprü district

A seasonal population fluctuation of plants bugs gradually varied on cotton plants during the sampling periods in Uydukent district. A total of 337 plants bugs were caught by sweep-net (Figure 5). The largest mean of catches by sweep-net were recorded on 8 October (7.2), followed by 1 October (6.6), 17 September (5.0), 24 September (4.8), 15 October (3.2), 10 September (1.8), 13 -20 August (1.4), respectively. The highest number of catches by sweep-net were recorded in October (170), followed in September (125) and in August (42), respectively.

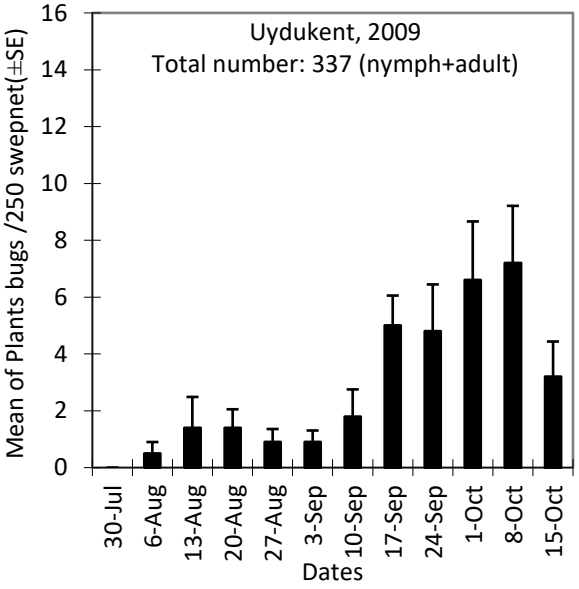

Figure 5. Mean (±SE) of plant bugs caught by sweep-net on cotton plant in Uydukent district

A seasonal population fluctuation of plants bugs gradually varied on cotton plants during the sampling periods in five sampled districts. A total of 1855 plants bugs were caught by sweep-net (Figure 6). The largest mean of catches by sweep-net were recorded on 8 October (5.66), followed by 1 October (5.58), 24 September (5.42), 17 September (4.46), 15 October (4.2), 3 September (3,92), 10 September (2.14), 13 August (2.0), 20 August (1.62), and 27 August (1.28), respectively. The highest number of catches by sweep-net were recorded in September (797), followed in October (772), in August (272) and in July (14), respectively.

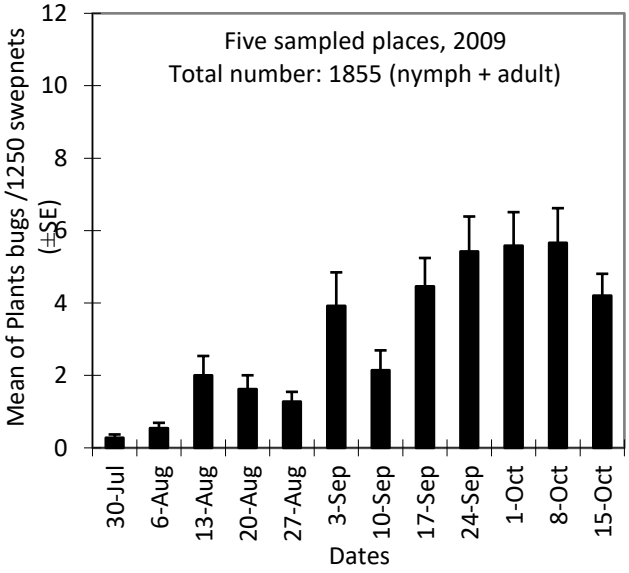

Figure 6. Mean (±SE) of plant bugs caught by sweep-net on cotton plant in five (fifty cotton fields) sampled districts

Plant bugs become important especially for the damage which they give to generative organs in cotton. They suck leaves, shoots, squares (floral buds), flowers and young bolls and cause damage of drying and shedding (Bailey, 1982; Leight et al., 1988; Hake et al., 1996; Hanny et al. 1977; Holman and Oosterhuis, 1999; Layton, 2000; Teague et al., 2002; Efil and İlkan, 2003; Efil and Bayram, 2009). The population density of *Creontiades pallidus* (Rambur) in cotton fields on the Harran Plain reached the peak in August and the first week of September (Efil and İlkan, 2003). The highest population of *Exolygus gemellatus* H.S., *Exolygus pratensis* Linnaeus and *Creontiades pallidus* Rambur. *Exolygus gemellatus* and *Exolygus pratensis* on cotton in Aydın province occurred in August and September (Ateş, 2018). Miridae population in Adana Province (Çukurova Region) increased from mid-July reaching the highest population density in late July or early August (Özgür et al., 2019). Musayev et al. (2020) reported that population density of *Creontiades pallidus* (Rambur) increased in cotton plant July - August at Amu Darya.

In conclusions, Miridae species, commonly known as plant bugs or Capsids, includes important pests of cotton plants. A seasonal population fluctuation of plants bugs (Hemiptera: Miridae), gradually varied on cotton plants in Kırıkhan, Reyhanlı, Kumlu, Demirköprü, Uydukent districts. A total of 1855 of plant bugs were caught by sweep-net at five (fifty cotton fields) sampled districts. The largest number of plants bugs catches by sweep-net were recorded in Demirköprü (587), followed by Reyhanlı (413), Uydukent (337), Kumlu (330), and Kırıkhan (188). In addition, the highest mean of catches by sweep-net were recorded on 8 October (5.66), followed by 1 October (5.58), 24 September (5.42), 17 September (4.46), 15 October (4.2), 3 September (3,92), 10 September (2.14), 13 August (2.0), 20 August (1.62), and 27 August (1.28), respectively. Moreover, the largest amount of plants bugs catches by sweep-net were recorded in September (797), followed in October (772), in August (272) and in July (14), respectively. In general, population density of plant bugs in Demirköprü, Reyhanlı, Uydukent and Kumlu districts were significantly higher than in Kırıkhan district.

ÖZET

***Amaç*:** Amik Ovası pamuk bitkilerinde bitki tahtakuruları (*Lygus gemellatus* (HerrichSchäffer), *Lygus pratensis* Linnaeus ve *Creontiades pallidus* (Rambur)) (Hemiptera: Miridae)'nın mevsimsel popülasyon dalgalanmasının değerlendirilmesi.

***Yöntem ve Bulgular*:** Çalışmalar Hatay İli Amik Ovasının Kırıkhan, Reyhanlı, Kumlu, Demirköprü ve Uydukent İlçelerinde bulunan elli pamuk tarlasında gerçekleştirilmiştir. Her ilçeden 10 farklı pamuk tarlası seçilmiştir. Örneklemeler haftalık olarak her pamuk tarlasından 45 cm çapında atrapla 25 (ileri-geri) şeklinde alınmıştır. Her bir örnekleme yeri ve pamuk tarlası için bitki tahtakurularının erginleri ve nimfleri bitki materyallerinden ayıklanmış, sayılmış ve kaydedilmiştir. Örneklenen beş ilçede (elli pamuk tarlası) toplam 1855 adet bitki tahtakurusu atrap ile yakalanmıştır. En fazla bitki tahtakurusu Demirköprü'de kaydedilirken, onu Reyhanlı, Uydukent, Kumlu ve Kırıkhan izlemiştir. Diğer örnekleme tarihlerine kıyasla en yüksek bitki tahtakurusu ortalaması 8 Ekim'de kaydedilmiştir. Ayrıca, en büyük miktarda bitki tahtakurusu Eylül ayında kaydedilmiş, bunu Ekim, Ağustos ve Temmuz ayları takip etmiştir. Genel olarak, Demirköprü, Reyhanlı, Uydukent ve Kumlu İlçelerinde bitki tahtakurusu popülasyon yoğunluğu Kırıkhan İlçesine göre önemli ölçüde yüksek bulunmuştur.

***Genel Yorum*:** En fazla bitki tahtakurusu Demirköprü'de kaydedilirken, onu Reyhanlı, Uydukent, Kumlu ve Kırıkhan İlçeleri izlemiştir. Ayrıca, en fazla sayıda bitki tahtakurusu Eylül ayında kaydedilirken, bunu Ekim, Ağustos ve Temmuz ayları takip etmiştir.

***Çalışmanın Önemi ve Etkisi*:** Örneklenen beş bölgede toplam 1855 adet bitki tahtakurusu atrap tarafından yakalanmıştır. En fazla bitki tahtakurusu Demirköprü'de kaydedilirken, onu Reyhanlı, Uydukent, Kumlu ve Kırıkhan İlçeleri izlemiştir. Ayrıca, en büyük miktarda bitki tahtakurusu Eylül ayında kaydedilmiş, bunu Ekim, Ağustos ve Temmuz ayları takip etmiştir. Genel olarak, Demirköprü, Reyhanlı, Uydukent ve Kumlu İlçelerinde bitki tahtakurusunun popülasyon yoğunluğu Kırıkhan İlçesine göre önemli ölçüde yüksek bulunmuştur.

***Anahtar Kelimeler*:** Bitki tahtakurusu (Hemiptera: Miridae), pamuk , Amik Ovası.

CONFLICT OF INTEREST

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

REFERENCES

Ateş N (2018) Determination of population chances of Miridae (Hemiptera) species and their natural enemies in different cultivated plants in Aydın province by different sampling methods. Aydın

Adnan Menderes Üniversitesi, Fen Bilimleri Enstitüsü, Bitki Koruma Anabilim Dalı 101 p.

Bailey JC (1982) Influence of plant bug and leafhopper populations on glabrous and nectariless cotton. Environ. Entomol. 11(5): 1011-1013.

Capinera JL (2002) Handbook of Vegetable Pests. Academic Press. San Diego, San Francisco, New York, Boston, London, Sydney, Tokyo 729p.

Cranshaw W, Demirel N (2006) Early Season Sampling of Three Pests of Oilseed Brassicas (False Chinch Bug, Phyllotreta Flea Beetles, Lygus Bugs) on Cultivated and Non-Cultivated Crops. Colo. Agric. Expt. Stn. Bull. TB06-02. 18p.

Demirel N (2009) Determination of Heteroptera species on canola plants in Hatay province of Turkey. Afr. J. Agric. Res. 4(11): 1226-1233.

Demirel N, Cranshaw W (2006) Surveys of *Lygus* spp. and their movement on cultivated crops and non-cultivated habitats throughout growing season in Colorado. Pakistan. J. Biol. Sci. 9: 197-200.

Demirel N, Cranshaw W (2007). Evaluation of plant yield responses to artificial ınfestations of *Lygus elisus* (Van Duzee) and *Nysius raphanus* (Howard) on spring canola. J. Entomol. 4: 225-230.

Demirel N, Cranshaw W, Norton A (2005) Survey of *Lygus* spp. and an associated parasitoid, *Leiophron uniformis* (Gahan), in Colorado. Southwestern Entomol. 30: 9-15.

Efil L, Bayram A (2009) Factors affecting the distribution of two mirid bugs, *Creontiades pallidus* (Rambur) and *Campylomma diversicornis* (Reuter) (Hemiptera: Miridae) and notes on the parasitoid *Leiophron decifiens* Ruthe (Hymenoptera: Braconidae). Entomol. Fenn. 20: 9-17.

Efil L, İlkan A (2003) Determination of population alteration of harmful insect *Creontiades pallidus* Rmb. (Hemiptera: Miridae) in cotton in Harran Plain. Proceeding of Third GAP Agriculture Congress (2-3 October 2003, Şanlıurfa, Turkey), 686 pp.

Gerber GH, Wise IL (1995) Seasonal occurrence and number of generations of *Lygus lineolaris* and *Lygus borealis* (Heteroptera: Miridae) in southern Manitoba. Can. Entomol. 127: 543-559.

Hake SJ, Hake KD, Kerby TA (1996) "Prebloom Decisions, 29-50". In: Cotton Production Manual (Eds. S. J. Hake, T. A. Kerby & K. D. Hake). University of California, Division of Agriculture and Natural Resources, Oakland, California, U.S.A., 417 pp.

Hanny BW, Cleveland TC, Meredith, Jr. WR (1977) Effects of tarnished plant bug (*Lygus lineolaris*) infestation on pre-squaring cotton (*Gossypium hirsutum*). Environ. Entomol. 6: 460-462.

Holman EM, Oosterhuis DM (1999) Cotton photosynthesis and carbon partitioning in response to floral bud loss due to insect damage. Crop Sci. 39: 1347-1351.

Holopainen JK, Varis AL (1991) Host plants of the European tarnished plant bug *Lygus rugulipennis* Poppius (Het., Miridae). J. Appl. Entomol. 111: 484-498.

Jay CN, Cross JV, Burgess C (2004) The relationship between populations of European tarnished plant bug (*Lygus rugulipennis*) and crop losses due to fruit malformation in everbearer strawberries. Crop Prot. 23: 825-834.

Karsavuran Y (2004) Pamuk zararlılarına karşı savaş yöntemlerinin uygulanmasında dikkat edilmesi gereken ana konular. Ege Üniversitesi Ziraat Fakültesi Dergisi 41(1): 191-200.

Kelton LA (1975) The Lygus bugs (Genus Lygus Hahn) of North America (Heteroptera. Miridae). Mem. Entomol. Soc. Can. 95: 1-101.

Layton MB (2000) Biology and damage of the tarnished plant bug, Lygus lineolaris, in cotton. Southwestern Entomological Society, Supplement 23: 7-20.

Leight TF, Kerby TA, Wynholds, PF (1988) Cotton square damage by the plant bug, *Lygus hesperus* (Hemiptera: Heteroptera: Miridae), and abscission rates. J. Econ. Entomol. 81: 1328-1337.

Musayev DM, Kholmatov BR, Sattarov NR, Amirov IBU, Musayeva MK, Mamatmurotovich AS (2020) Cotton shredder bug *Creontiades pallidus* (Rambur, 1839) damage to cotton crop in Surkhandara region of South Uzbekistan. Eurasian J. Biosci. 14: 4683-4687.

Nordlund DA (2000) The Lygus problem. Southwestern Entomologist. Suppl. No. 23. pp. 1-5.

Önder F, Karsavuran Y, Tezcan S, Fent M (2006) Türkiye Heteroptera Insecta Katalou. Meta Basım Matbaacılık Hizmetleri. Bornova-iZMiR. 164p.

Özgür O, Atakan E, Pehlivan S (2019) Investigation of the damage of Miridae species on cotton in Çukurova Region of Turkey. Türk. Entomol. Derg. 43(2): 143-156.

Pedigo LP (1999) Entomology and Pest Management. Third Edition. Prentice Hall, New Jersey. 691p

Rosentheim JA, Goeriz,RE, Thacher EF (2004) Omnivore or herbivore? Field observations of foraging by Lygus hesperus (Hemiptera: Miridae). Environ. Entomol. 35: 1362-1370.

SAS Institute (1990) User's Guide, version 6. SAS Institute, Cary, NC, USA.

Schuh RT (1995) Plant Bugs of the World (Insecta: Heteroptera: Miridae): Systematic Catalog, Distributions, Host List and Bibliography. New York Entomological Society, New York, NY, 1329 pp.

Schuh RT, Slater JA (1995) True Bugs of the World (Hemiptera: Heteroptera). Classification and Natural History. Comstock Pub. Associates. Ithaca, NY. 336p.

Teague TG , Coy S, Tugwell NP, Villavaso EJ (2002) Comparison of cotton plant response to square loss following manual removal or tarnished plant bug feeding: Results from field trials in 2001. In Proceedings, Beltwide Cotton Conferences, National Cotton Council, Memphis, TN.

Teague TG, Tugwell NP, Villavaso EJ (2001) Comparison of cotton plant response to square loss following manual removal or tarnished plant bug feeding results from field trials in 2000, pp. 1149-1156. In Proceedings, Beltwide Cotton Conferences, National Cotton Council, Memphis, TN.

Tugwell PS, Young SC, Dumas BA, Phillips JR (1976) Plant bugs in cotton: Importance of infestation time, types of cotton injury, and significance of wild hosts near cotton. Ark. Agric. Expt. Stn. Rept. Tech. Bull. 227: 24.

Wheeler AG Jr (2000) Plant Bugs (Miridae) as Plant Pests. Pp. 37-83. In. C.W. Schaefer, and A. R. Panizzi (eds). Heteroptera of Economic Importance. CRC Press, Boca Raton, London, New York, Washington, D.C. 828p.

Wheeler AG Jr (2001) Biology of the Plant Bugs (Hemiptera. Miridae). Pests, Predators, Opportunists. Comstock Publishing Associates. Cornell University Press. Ithaca and London 507p.