PENTATOMID (HETEROPTERA) SPECIES DAMAGING BUDS AND FRUITS OF WILD AND CULTIVATED CAPERS (CAPPARACEAE) AND PENTATOMID EGG PARASITOIDS IN SOUTHEASTERN ANATOLIAN REGION OF TURKEY

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ABSTRACT: This study was conducted on bud and fruits of wild and cultivated caper plants to determine pentatomid species, their damage and egg parasitoids in Adıyaman, Diyarbakır, Mardin and Şanlıurfa provinces of Southeastern Anatolia region of Turkey. The study was carried out between July and September in 2010-2012 years. *Acrosternum millierei* (Mulsant et Rey, 1866), *Bagrada abeillei* Puton, 1881, *Bagrada amoenula* (Walker, 1870), *Carpocoris fuscispinus* (Boheman, 1851), *Codophila varia* (Fabricius, 1787), *Dolycoris baccarum* (Linnaeus, 1758) and *Eurydema ornata* (Linnaeus, 1758) were determined as pentatomid species from Heteroptera order. *Trissolcus semistriatus* Nees., *T. grandis* Thomson and *T. vassilievi* Mayr (Hymenoptera, Scelionidae) were recorded as their egg parasitoids. The nymph and adults of the pentatomid species fed on bud and fruits; therefore, it was concluded that the bud deformity and the spots on the fruits were due to these organisms. We could say that the current results could be a useful reference for further studies on this area.

KEY WORDS: Caper, pentatomid species, bud damage, fruit damage, egg parasitoids

The caper bush (*Capparis spinosa* L., Capparidaceae), known from ancient times, is a deciduous species widespread in Mediterranean Europe, Africa, Asia and Australia. Its flower buds, known as capers, are popular in food seasoning, and different parts of the plant are utilized in pharmacology and cosmetics (Sozzi, 2001; Rivera et al., 2003). The caper plant is native to tropical and subtropical parts of the world. Although 2 species were defined in Turkey, there are more than 350 caper species worldwide. The species from Turkey are *Capparis ovata* Desf. (which is a dwarf type) and *Capparis spinosa* L. (which is a tall type) (Yeğenoğlu & Uz, 2011). The buds are profound in many bioactive compounds such as flavonoids and glucosinolates, which are very nutritious. The caper buds show increasing popularity in Turkey and important for export. The total caper bud production in the world is approximately 10 000 tons and the main producers are Spain, Morocco and Italy (Alvarruz et al. 1990). Turkey is between the countries getting important revenue from exporting capers. Turkey exports 3 645 tons pickled and 1 881 tons canned or frozen capers (in total 5 526 tons. There are many bugs feed on caper plants. Bugs causing damage on caper plants belong to the *Bagrada hilaris* (Burmeister), *Nezara viridula* (L.), *Eurydema ventralis* Kol., *Eurydema ornata* (L.), *Holcostethus punctatus* (Lindberg), *Antheminia lunulata* (Goeze) Pentatomidae families (Infantino et al. 2007). *Eurydema eckerleini* Josifov species causing serious damage on caper, from Cyclades Islands in Greece, was also included to the above list. All these species are polyphagous and rarely represent a serious problem for caper, but *B. hilaris* is an oligophagous species which not only infests crucifers (Huang et al., 2011) but also is a major pest of caper crops in many parts of Asia and Africa (Colazza et al., 2004; Infantino et al., 2007).

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MATERIAL AND METHODS

The study was conducted on wild and cultivated capers from Akpınar (37°43"08"E, 41°54'66"N, 653m), Kuştepe (37°46'67"E, 38°25'43"N, 687 m) and Reşatlı (37°43'27"E, 41°47'83"N, 609m) districts of Adıyaman province; Institute trial land of Diyarbakır province (37°56'26"E, 40°15'03"N, 732m); Mazıdağı-Ömürlü (37°63'40"E, 41°53'07"N, 921m), Derecik (37°63'52"E, 41°55'68"N, 911m) and Derik (37°61'38"E, 41°38'25"N, 952m) districts of Mardin; Bozova-Yalıntaş (37°46'59"E, 41°36'24"N, 561m), Tatarhöyük (37°46'82"E, 41°36"12"N, 575m), Beyazpınar (37°47'38"E, 41°38'67"N, 634m) and Hilvan-Uluyazı (37°37'66"E, 38°52'68"N, 538m) districts of Şanlıurfa province between July and September in 2010-2012 years. The caper plants were examined for mature insects and nymphs. Pentatomid eggs and nymphs on the caper plants were collected and cultured in the lab. The hatching nymphs were fed with caper fruits until matured. The egg parasitoids were stored at %70 alcohol.

RESULTS AND DISCUSSION

Acrosternum millierei (Mulsant and Rey, 1866), *Bagrada abeillei* Puton 1881, *Bagrada amoenula* (Walker, 1870), *Carpocoris fuscispinus* (Boheman, 1851), *Codophila varia* (Fabricius, 1787), *Dolycoris baccarum* (Linnaeus, 1758) and *Eurydema ornata* (Linnaeus, 1758) species within Pentatomidae (Heteroptera) family feeding on wild and cultivated caper plants growing in Adıyaman, Diyarbakır, Mardin and Şanlıurfa provinces of Southeastern Anatolia region of Turkey were determined (Fig. 3).

Studies conducted in different countries stated that *Nezara viridula* (L.), *Eurydema ventrale* Kol., *Antheminia lunulata* (Goeze), *Eurydema ornata* (Linnaeus, 1758), *Holcostethus punctatus* L., *Carpocoris lunula* F. (Infantino et al., 2007), *Eurydema eckerleini* Josifov from Cyclades Islands in Greece (Simoglou & Dioli, 2017) and *Bagrada hilaris* (Burmeister) (Huang et al., 2011) species are feeding on caper plants.

It was observed that *Bagrada abeillei*, *B. amoenula*, *Carpocoris fuscispinus*, *Codophila varia*, *Dolycoris baccarum* species were feeding on caper plants without forming population, whereas *Acrosternum millierei* and *Eurydema ornata* species formed population. Besides caper, *E. ornate* was feeding with Cruciferae also. *A. millierei* was detected on caper plants only. Caper plants are attractive to pentatomids, because they stay green during the hot and dry period after the cereals harvest when many annual wild plants complete their vegetation. The pentatomids feed on caper plants during the dry period until the end of July. Suckings appear on bud and fruits of capers during this time. Bud deformation and bud (1-5 mm diameter) fall could occur due to pentatomid feeding. Bigger buds (diameter $\geq$10 mm) show liquid exudation and lower quality. The fruit quality decreases due to the spots formed by the suckings and the color change caused by the enzymes secreted in the fruit flesh (Fig. 2). Both adults and nymphs of *E. eckerleini* were detected feeding on the foliage and flower buds of caper, which caused white chlorotic spots on the leaf parenchyma tissues where the sucking took place Simoglou & Dioli (2017). Consequently, adults and nymphs

suckings lower the quality of caper buds and fruits, thus decrease the economic value of the crop. Natural enemies of these species in the form of egg parasitoids were detected. These enemy species were *Trissolcus semistriatus* Nees., *T. grandis* Thomson, *T. vassilievi* Mayr (Hym.; Scelionidae) and *Ooencyrthus* sp. (Hym.; Encyrtidae) (Fig. 1). Many species within Pentatomidae (Hemiptera) family are alternative hosts of *Trissolcus* species (Kılıç et al., 1980; Kıvan, 1998; Tarla & Doğanlar, 1999; Kodan et al., 2007; Çetin et al., 2009; Gözüaçık & Yiğit, 2016).

CONCLUSIONS

Seven pentatomid species were detected on wild and cultivated caper plants growing on Adıyaman, Diyarbakır, Mardin and Şanlıurfa provinces of Southeastern Anatolia region of Turkey. These species fed on caper buds and fruits. It was found that the penatomids caused more severe damage on the cultivated caper plants. It was observed that the local people don't utilize the wild caper buds and fruits in their area. However, the damage from pentatomids in these places is lower, because the surviving chance of their enemies in the wild is greater.

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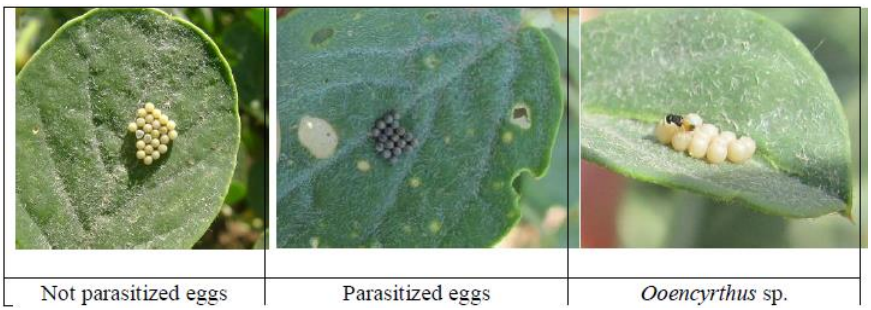

Figure 1. Pentatomid species on caper plant.

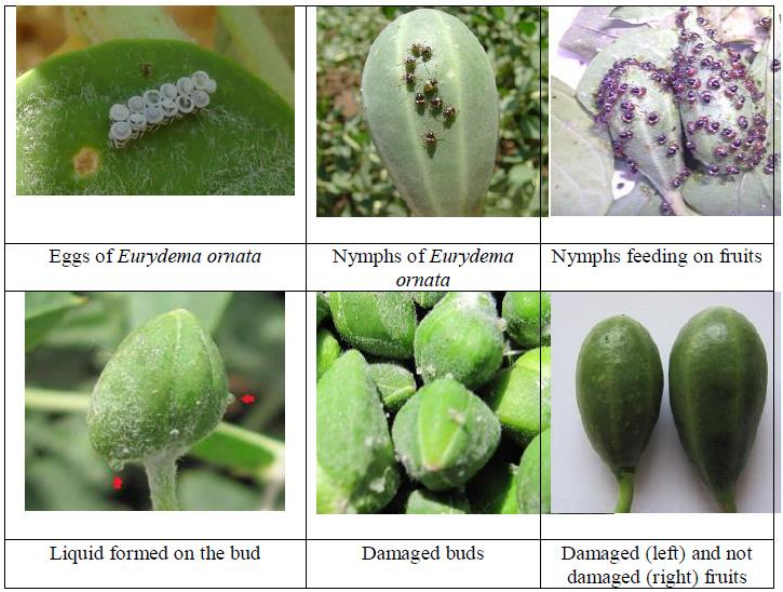

Figure 2. Damage of Pentatomid species on bud and fruit.

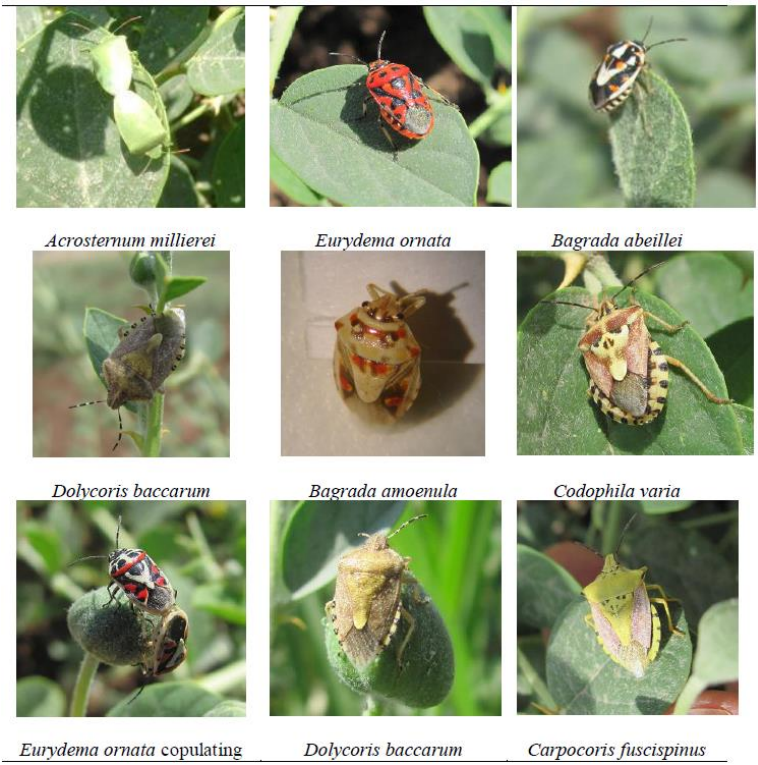

Figure 3. Pentatomid species on caper plant.