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Parasitism of ***Hyalopterus pruni*** (Geoffroy, 1762) (Homoptera: Aphididae) by larvae of ***Allothrombium triticium*** Zhang, 1995 (Acarina: Trombidiidae) and ***Erythraeus* (*Erythraeus*) *ankaraicus*** Saboori, Cobanoglu & Bayram, 2004 (Acarina: Erythraeidae) larvae on ***Phragmites austrialis*** L. (Poaceae)

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Summary

Allothrombium triticium Zhang, 1995 and ***Erythraeus*** (***Erythraeus***) ***ankaraicus*** Saboori, Cobanoglu & Bayram, 2004 (Acarina: Prostigmata: Trombidiidae, Erythraeidae) samples were collected on Mealy plum aphid ***Hyalopterus pruni*** (Geoffroy, 1762) (Homoptera: Aphididae) which was exist on secondary host ***Phragmites austrialis*** L. (Poaceae) during 2001-2002, Ankara-Turkey. ***A. triticium*** was found in a higher density than ***E. ankaraicus*** on aphids. Larvae of ***A. triticium*** peaked in mid June while ***E. ankaraicus*** peaked at the beginning of July on ***H. pruni***. It was observed that these species preferred the thorax of aphids as attachment site. In the current study, density of each mite species exist on the host, their preference to the biological development stages of aphids and seasonal abundances were evaluated.

Key words: Acari, Trombidiidae, Erythraeidae, ***Allothrombium, Erythraeus***, ***Phragmites***, ***Hyalopterus***

Anahtar sözcükler: Acari, Trombidiidae, Erythraeidae, ***Allothrombium***, ***Erythraeus***, ***Phragmites***, ***Hyalopterus***

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Introduction

Mealy plum aphid ***Hyalopterus pruni*** (Geoffroy, 1762) (Homoptera: Aphididae) is an important pest of several stone fruit trees such as plum, almond, apricot and peach trees. ***H. pruni***, is an heterecious species; and beside primary host trees it have many secondary hosts including reed (***Phragmites austrialis*** L., ***P. communis*** Trin. and ***Arundo*** spp.) and purple moor grass (***Molinia*** sp.) (Poaceae) in Turkey (Lodos, 1982; Özdemir, 2004). Several plant diseases, such as the mosaic virus of cucumber are transmitted by these aphid species. The life cycle of many aphids is unusual and complex. ***H. pruni*** can cause serious damages on the above mentioned trees during the early spring. The first generation of ***H. pruni*** is usually wingless but winged individuals appear afterwards and migrates to reed plants (***Phragmites*** spp.). Finally, they turn back to the main hosts at the end of season in autumn (Lodos, 1982; Toros et al., 2002; Özdemir, 2004). At the current time, aphids have developed resistance to many commonly used pesticides. Thus, pestiside resistance problems require alternative control strategies such as biological control agents (Zhang & Chen, 1993).

Aphids have many natural enemies such as insects, mites and other arthropods. Especially, ectoparasitic mites have an important impact on these pests among these natural enemies. Larval stages of the mites exist in the families Trombidiidae and Erythraeidae (Acari: Prostigmata) have a restrictive impact on populations of several kinds of small arthropods. They are especially parasitic on various insects and arachnids, which are serious pests of many cultivated plants (Eickwort, 1982; Welbourn, 1983; Zhang & Norbakhsh, 1995; Zhang, 1998; Goldarezana et al., 2000). In addition, several trombidiid and erythraeid species were reported as ectoparasitic on small insects especially from the orders Coleoptera, Orthoptera, Diptera, Lepidoptera, Heteroptera, Homoptera, Hymenoptera and Thysanoptera hitherto (Welbourn, 1983; Goldarezana et al., 2000).

These two families are not studied taxonomically in detail and there have been some difficulties in the identification of these species. Limited number of studies and systematic researchers in this subject, the complex heteromorphic life cycle of these agents and the necessity in the accurate identification of larval and postlarval stages of these species make the studies difficult. However, host-parasite relationships and biology of most species are still unknown, preliminary data suggest that these mites are important natural enemies of insect pests (Welbourn, 1983). The members of Erythraeidae and Trombidiidae families are parasitic only in the larval stage "protealean parasites" and are free-living predators in their nymphal and adult stages. Their larval and post larval stages have different morphology and the two stages have rarely been associated. It is quite difficult to estimate the host range of a species as larvae or to determine the acceptable prey of its post larval stages (Treat, 1975).

There have been some studies on Trombidiidae and Erythraeidae families in America, Europe and Asia (Zhang, 1992; Fain & Çobanoğlu, 1998). Additionally, a few species belong to Trombidiidae and Erythraeidae have been reported in Turkey hitherto (Fain & Çobanoğlu, 1998; Goldarazana et al., 2000; Haitlinger, 2000; Çobanoğlu et al., 2003; Saboori et al., 2004). ***Allothrombium*** and ***Erythraeus*** are important genus of the families Trombidiidae and Erythraeidae. Their larvae are common ectoparasites of many species of aphids (Anonymous, 1983; Goldarazena & Zhang, 1998; Saboori et al., 2004). Very limited data are available about these species in Turkey. In the current study, the parasitism ratio of the ectoparasitic mites of ***A. triticium*** and ***E. ankaraicus*** on ***H. pruni***, their host developmental stage preferences and seasonal distribution on the second hosts have been investigated.

Material and Methods

A. triticium and ***E. ankaraicus*** samples were obtained on ***H. pruni*** from ***P. austrialis*** in central of Ankara during 2001 and 2002. The sampling were done while the aphids begin to damage on the secondary host plants. All the reed leaves includes the aphids are collected and encountered ectoparasitic mites and aphids were counted on them. The two ectoparasite mite species were counted together because they tend to move very fast and escape easily. The mite species were identified after the preparation of the samples in labarotory. The predatory mites were collected at their ectoparasitic larval stages and preserved in 70 % ethyl alcohol. After clearing the mite samples in lactophenol solution, they were mounted in Hoyer's medium. Following this, density of parasites for each mite species on the host and seasonal abundance were detected. The parasitism ratio of these two mite species on ***H. pruni*** and effect of parasitism for each aphid stages were evaluated together.

Mite samples were identified by Alireza Saboori (Department of Plant Protection, College of Agriculture, Tehran University, Karaj, Iran). The samples have been deposited as a part of second authors' collection at the University of Ankara, Plant Protection Department, Ankara. The host plant was identified by Dr. Solmaz Sözeri (University of Ankara, Faculty of Agriculture, Plant Protection Department, 06110 Dışkapı, Ankara, Turkey).

Results and Discussion

Larvae of the two ectoparasitic mite species were observed on the nymphal and adult stages of ***H. pruni***. We found ***A. triticium*** and ***E. ankaraicus*** on ***H. pruni*** feeding on ***P. austrialis*** in Ankara during 2001-2002 and evaluated their parasitism ratio, preferences of host developmental stages and distribution on host in the growing seasons.

Trombidiidae

Allothrombium triticium Zhang, 1995

A. triticium with larvae ectoparasitic on wheat aphids and a predatory species on adult stage and described for the first time in Iran (Zhang & Norbakhsh, 1995). ***A. triticium*** adult female was described under the stones in Tehran, Iran (Saboori & Kamali, 2000). Zhang and Saboori (1996) reported that ***A. triticium*** larvae were also ectoparasites on ***Coccinella septempunctata*** L. (Coleoptera: Coccinellidae) from Iran. This indicates that ***A. triticium*** larvae can attack insects of order Coleoptera and members of coccinellids. ***A. triticium*** was reported by Haitlinger (2000) for the first time in Turkey. These mite larvae were founded ectoparasites on ***Adalia bipunctata*** (L.) in Turkey (Bayram et al., 2005). During this study ***A. triticium*** has larvae ectoparasite on aphids and free living predators in post-larval stages.

Erythraeidae

Erythraeus (***Erythraeus***) ***ankaraicus*** Saboori, Cobanoglu & Bayram, 2004

Ectoparasitic larvae of ***E. ankaraicus*** were identifed as a new species on adults and nymphs of ***H. pruni*** in Turkey on ***P. austrialis*** (Saboori et al., 2004). It is a fast moving mite. They are ectoparasites at the larvae and free predators at the post-larval stages.

Both of these parasitic species have conspicuous, red larvae on their hosts, and the larvae feed on the hosts voraciously. The parasitic mites drain some energy from the host thus they do not kill the hosts immediately. On the other hand, their effects on host longevity and fecundity were undetermined at the current time (Treat, 1975). Moreover, according to the reported functional relationship between parasite ***Allothrombium pulvinum*** Ewing on ***Aphis gossypii*** Glover and ***A. fabae*** Scopoli (Homoptera: Aphididae), host mortality was increased with increasing parasite loads but nothing is known about the intraspecific competition among mite parasites on aphid hosts (Zhang & Chen, 1993). Both of the mite species preferred the aphid ventral and lateral of thorax region as an attachment site (Fig. 1 A-B). Out of 272 of the 12523 aphids were found parasitized (2.17 %) during the growing season of ***P. austrialis*** which served as a secondary host for these aphid species. Concerning the number of mites counted on aphids; the mean number of mites load on each aphid is 1.3. Maximum 6 mites were counted on a host insect. The highest number of aphids parasitised by one mite (76.84 %), the second row is belongs to two (16.17 %) while the least number of aphids are parasitized by six mites (0.37 %) (Fig.2).

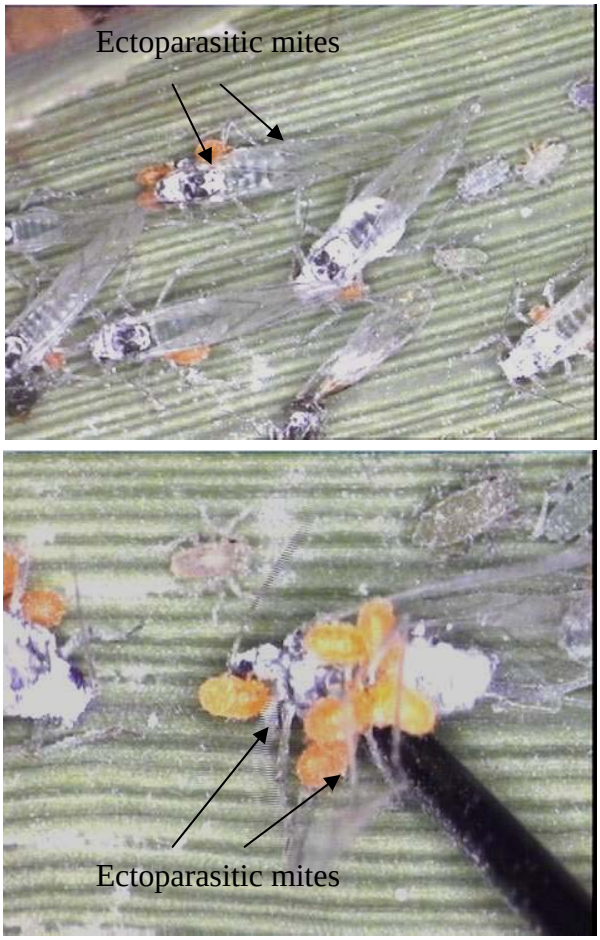

Figure 1. Mealy plum aphid infected by ectoparasitic mites. (A) Dorsal view, (B) Ventral view.

Mites are larvae ectoparasitic on the nymphs and adult stages of aphids. They prefer the generally nymphal stages of host thus, while 171 (62.86 %) aphids of the 272 parasitised individuals were in nymphal stages, the other 101 (37.13 %) individulas were parasited in their adult stages. For considering the density of mite samples according to the host stages, 213 mites was found on nymphs and 151 mites was found on the adult stages of aphids (Table 1). When we compare the ratio of the mite species, ***A. triticium*** was seen more abundant than ***E. ankaraicus***. Their occurence ratios were found 88.46 % and 11.53 % (322 and 42), respectively. Larvae of ***A. triticium*** peaked in numbers on aphid in mid of June 2001, while larvae of ***E. ankaraicus*** peaked at the beginnig of the July 2002. Host – parasite mortality is increasing depending on the stronger aggregation on higher parasite loads (Zhang & Chen, 1993; Kretzcshmar & Alder, 1993). It can be said that, ***A. triticium*** is more effective comparing to the ***E. ankaraicus*** for their loading. However, nothing is known about the intraspecific competition among mite parasites on aphid hosts (Zhang & Chen, 1993).

Table 1. ***Allothrombium triticium*** and ***Erythraeus* (*Erythraeus*) *ankaraicus*** ectoparasitic larvae on ***Hyalopterus pruni***; their host stage preferences and obtained number of mites for each ectoparasites during 2001-2002 in Ankara

Collection date	Leaf numbers	Aphid numbers	Numbers of aphids ectoparsitized by mites	Numbers of adult stage of aphids ectoparsitized by mites	Numbers of nymph stage of aphids ectoparsitized by mites	Mite numbers obtained from adult stages of aphids	Mite numbers obtained from nymph stages of aphid	***A. triticium***	***E. ankaraicus***	Total mite numbers
13.06.2001	1	300	29	-	29	-	48	48	-	48
18.06.2001	2	250	70	52	18	90	31	121	-	121
20.06.2001	2	870	4	-	4	-	5	1	4	5
29.06.2001	2	243	25	-	25	-	32	32	-	32
06.07.2001	2	79	6	-	6	-	6	-	6	6
11.07.2001	3	450	8	-	8	-	8	3	5	8
13.07.2001	5	848	8	1	7	-	10	10	-	10
30.07.2001	12	-	-	-	-	-	-	-	-	-
sub-total	**29**	**3040**	**150**	**53**	**97**	**90**	**140**	**215**	**15**	**230**
21.05.2002	6	545	9	5	4	6	4	3	7	10
28.05.2002	7	1685	29	16	13	19	15	27	7	34
03.06.2002	6	931	13	11	2	14	2	16	-	16
14.06.2002	12	4139	40	13	27	19	21	40	-	40
28.06.2002	4	935	11	2	9	2	9	11	-	11
03.07.2002	4	-	-	-	-	-	-	-	-	-
08.07.2002	4	-	-	-	-	-	-	-	-	-
09.07.2002	6	1248	20	1	19	1	22	10	13	23
sub-total	**49**	**9483**	**122**	**48**	**74**	**61**	**73**	**107**	**27**	**134**
Total	**78**	**12523**	**272**	**101**	**171**	**151**	**213**	**322**	**42**	**364**

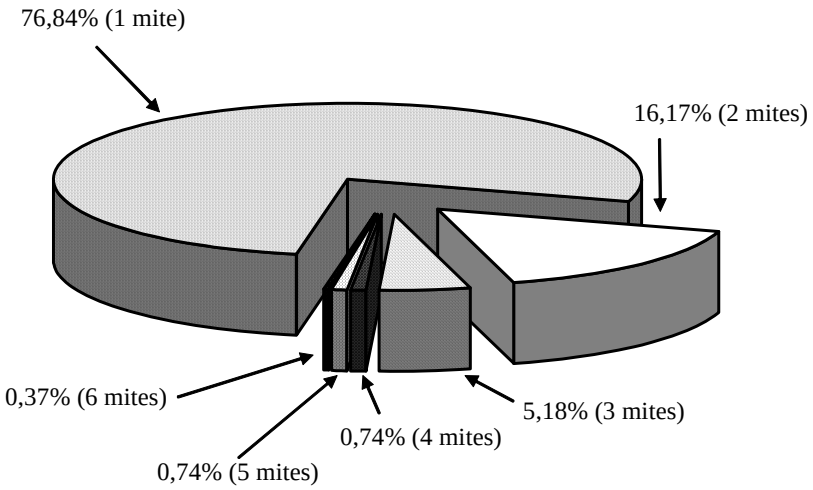

Figure 2. The ratio of aphids infected by different number of mites.

Climatic factors in addition to the situation of secondary host plants and natural enemies have important impacts in the seasonal population fluctuations of aphids. Thus, the parasitism ratio was 4.93 % during 2001 while it was 1,28 % in 2002 (Table 1). Determination of the seasonal abundance of the natural enemies of aphids especially on the herbaceous plants is very important in order to be successfull in biological control applications especially in terms of integrated pest management strategies. Host-parasitic mite relationships and their biologies are still not well known in Turkey and thus, should be investigated in the further studies.

Özet

Phragmites austrialis **L. (Poaceae) üzerinde** *Hyalopterus pruni* **(Geoffroy, 1762) (Homoptera: Aphididae)'de ektoparazit iki akar** *Allothrombium triticium* **Zhang, 1995 (Acarina: Trombidiidae) ve** *Erythraeus* (*Erythraeus*) *ankaraicus* **Saboori, Cobanoglu & Bayram, 2004 (Acarina: Erythraeidae)**

Hyalopterus pruni (Geoffroy, 1762) (Homoptera: Aphidiidae) üzerinde ektoparazit iki akar türü; ***Allothrombium triticium*** Zhang, 1995 (Acarina: Prostigmata: Thrombidiidae) ve ***Erythraeus*** (***Erythraeus***) ***ankaraicus*** Saboori, Cobanoglu & Bayram, 2004 (Acarina: Prostigmata: Erythraeidae), ara konukçu ***Phragmites austrialis*** L. (Poaceae) üzerinden, Ankara'da 2001-2002 yıllarında toplanmıştır. ***H. pruni*** üzerinde ***A. triticium***, ***E. ankaraicus***'a oranla daha yüksek yoğunlukta bulunmuştur. ***A. triticium*** larvaları, yaprakbiti üzerinde haziran ortasında, ***E.*** (***E.***) ***ankaraicus*** larvaları ise temmuz başında en yüksek yoğunluğa ulaşmaktadır. Ektoparazit akarlar, yaprakbitine tutunmak için thoraks bölgesini tercih etmektedir. Bu çalışmada bu akarların, yaprakbitinin biyolojik dönemlerini tercihleri, yoğunluğu ve mevsimel dağılımı değerlendirilmiştir.

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