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Contribution to the study of tenebrionid beetles (Coleoptera: Tenebrionidae) in ecological cherry orchards in İzmir and Manisa provinces of Turkey

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Summary

The aim of this study was to verify and assure the presence or absence of tenebrionid beetles in ecological cherry orchards in Turkey and hence contribution to Tenebrionidae fauna of Turkey. To fulfil this aim, a study was conducted in ecological cherry orchards in Manisa (Central province-Muradiye) (38° 39' N / 27° 20' E), İzmir (Kemalpaşa-Ören) (38° 28' N / 27° 36' E) and İzmir (Kemalpaşa-Armutlu) (38° 25' N / 27° 32' E), of western Turkey during the years 1998 & 1999. Tenebrionid beetles were collected mainly by pitfall traps and also bait traps as well as knock down methods.

At the end of this study, a total of 16 tenebrionid species were determined. These were ***Dailognatha quadricollis*** Brullé, ***Tentyria rodundata mittrei*** Solier, ***Idastrandiella mucoreus*** Waltl, ***Pachyscelis quadricollis smyrnensis*** Kraatz, ***Pimelia akbesiana*** Fairmaire, ***Blaps tibialis*** Reiche, ***Blaps halophila*** Fischer, ***Dendarus moesiacus*** Mulsant & Rey, ***Gonocephalum granulatum pusillum*** Fabricius, ***Gonocephalum costatum rugulosum*** Küster, ***Opatrum sabulosum*** Linnaeus, ***Opatroides punctulatus subcylindricus*** Brullé, ***Alphitobius diaperinus*** Panzer, ***Diaclina fagi*** (Panzer), ***Probaticus tenebricosus*** Brullé and ***Euboeus mimonti*** Boildieu. Among those ***Pachyscelis quadricollis smyrnensis*** and ***Pimelia akbesiana*** are endemic and ***Gonocephalum granulatum pusillum, Dailognatha quadricollis*** and ***Pimelia akbesiana*** are more abundant than others. Species, Simpson and Shannon indices of diversity were employed in the evaluation of species.

Key words: Coleoptera, ecological agriculture, fauna, Tenebrionidae, Turkey

Anahtar sözcükler: Coleoptera, ekolojik tarım, fauna, Tenebrionidae, Türkiye

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Introduction

Cherry is an important fruit in Turkish economy. Aegean Region of Turkey constitute an important production region with 1.500.000 trees and 37.000 tons of fruit production. In this region, İzmir and Manisa provinces have large areas of cherry orchards. To prevent the side effects of conventional agriculture to human health and environment, ecological agriculture applications have been started all over the world. The application of ecological cherry production methods have been applied in a project in this important cherry production areas of western Turkey since 1998 (Tezcan et al., 1999). In this project, mainly key factors in plant protection studies of cherry orchards and also other faunal and floral factors were evaluated.

Although tenebrionids are not main pests of agriculture in Turkey, the studies of Gebien (1910), Winkler (1924-1932), Kaszab (1938; 1939; 1959; 1961), de Kerville (1939), Lodos (1998), Ferrer & Soldati (1999) and Keskin (1999) have great importance for elucidating and enlightening the Turkish Tenebrionidae. In recent studies, Ulu et al. (1995), Özbek et al. (1996) Ulusoy et al. (1999) and Özder (1999) indicated that, there is no any tenebrionid beetle found in cherry orchards up to now in Turkey. The aim of this study was to verify and assure the presence or absence of tenebrionid beetles in ecological cherry orchards in Turkey and hence contribution to Tenebrionidae fauna of Turkey. Moreover to give some information on their collection methods, collection period and abundance. To fulfil this aim, a study was conducted during the years 1998 and 1999.

Material and Methods

The experiments were conducted in ecological cherry orchards in three locations: Manisa (Central province-Muradiye) (380 39' N / 270 20' E), İzmir (Kemalpaşa-Ören) (38° 28' N / 27° 36' E) and İzmir (Kemalpaşa-Armutlu) (38° 25' N / 27° 32' E), of western Turkey. In these orchards there were 550 trees in Muradiye, 160 trees in Ören and 165 trees in Armutlu. The common varieties in those orchards were: "Sapıkısa, Napolyon" and "Salihli" in Ören and "Early burlat, Napolyon" and "Salihli" in Muradiye and Armutlu. Among these, Sapıkısa and Early burlat are early, Napolyon is mid, while Salihli is late maturing varieties.

Tenebrionid beetles were collected mainly by pitfall traps and also bait traps as well as knock down methods.

Pitfall traps consisted of 250 ml cups buried in the soil in such a way that the lip of the trap was at ground level. They were half filled with ethylen glycol and water mixture as 1:1 ratio. Three traps were used in each orchards during the period between 1 April 1998 and 20 December 1999. The beetles were collected and the traps cleared at two weeks intervals from the beginning of April up to the end of October in 1998 and 1999 and three weeks intervals from the beginning of November 1998 to the end of March 1999.

In each orchard, a total of 9 bait traps containing 100 ml wine, 900 ml water, 25 gr sugar and 25 ml vinegar per liter (Ulu et al., 1995) were hanged for monitoring one of a key pest, ***Archips rosanus*** adults. In checking those traps some tenebrionid beetles captured our attention and they were chosen, counted and included in this study.

In these orchards, insects were sampled also by knock down method with weekly intervals and the results of collection by this method were included in this paper. Material determined by junior author and confirmation was done by second author.

In the evaluation of taxons, the species, Simpson (S) and Shannon (H) indices of diversity were employed as described by Southwood (1971).

Results and Discussion

A total of 16 tenebrionid species were collected in the ecological cherry orchards (Table 1). Among these ***Pachyscelis quadricollis smyrnensis*** and ***Pimelia akbesiana*** are endemic. 10 and 5 species were found for the first time from Manisa and İzmir provinces, respectively. The collection methods, numbers and percentages of 16 species were also given in Table 1. As it has been observed from Table 1 that 1013 individuals were collected by pitfall traps and their percentage is 96,4 %; 20 individuals (1,9 %) were collected by bait trap and 18 individuals (1,7 %) were collected by knock down method. Collection by pitfall trap is the best method for sampling the tenebrionids though some species can be collected by bait traps and knock down methods. ***Alphitobius diaperinus*** was collected only once by knock down method while individuals of ***Euboeus mimonti*** were collected by all three methods. Collection of ***E. mimonti*** from the trunks, branches etc. of trees by knock down method indicated that, this species is distributed vertically up to the tip of plants. This constitutes the first recorded observation for this species.

Table 1. List of tenebrionid species and their collection methods in ecological cherry orchards in Manisa and İzmir provinces during 1998 and 1999

Species	Pitfall traps		Bait traps		Knock down	
	Number	%	Number	%	Number	%
Dailognatha quadricollis Brullé,1832	321	100	-	-	-	-
Tentyria rodundata mittrei Solier, 1835 **	1	100	-	-	-	-
Idastrandiella mucoreus (Waltl, 1838)	8	100	-	-	-	-
Pachyscelis quadricollis smyrnensis Kraatz, 1865 ** ***	9	100	-	-	-	-
Pimelia akbesiana Fairmaire, 1884 ** ***	238	98,8	3	1,2	-	-
Blaps tibialis Reiche, 1857 **	14	100	-	-	-	-
Blaps halophila Fischer, 1822 *	1	100	-	-	-	-
Dendarus moesiacus (Mulsant & Rey, 1854)	1	100	-	-	-	-
Gonocephalum granulatum pusillum (Fabricius, 1791) **	329	100	-	-	-	-
Gonocephalum costatum rugulosum (Küster, 1849) * **	3	100	-	-	-	-
Opatrum sabulosum (Linnaeus, 1761) * **	28	100	-	-	-	-
Opatroides punctulatus subcylindricus (Ménétriés, 1849) **	36	100	-	-	-	-
Alphitobius diaperinus (Panzer, 1797) **	-	-	-	-	1	100
Diaclina fagi (Panzer, 1799) *	1	100	-	-	-	-
Probaticus tenebricosus (Brullé, 1832)	5	25	15	75	-	-
Euboeus mimonti Boildieu, 1865 * **	18	48,6	2	5,5	17	45,9
Total	1013	96,4	20	1,9	18	1,7

* Determined for the first time in İzmir province ** Determined for the first time in Manisa province *** Endemic species

Collection began at the second half of April and completed mostly at the end of October in both years (Figure 1).The results of collection in 3 localities by pitfall traps in 1998 and 1999 were given in Table 2. The dominant species in

the catches of pitfall traps are: ***Gonocephalum granulatum pusillum, Dailognatha quadricollis*** and ***Pimelia akbesiana.*** The abundances of these three groups are 32, 31, 23 %, respectively and these 3 species constitute 86 % of all species sampled in both years. No damages by these species were observed in ecological cherry orchards during 1998 and 1999.

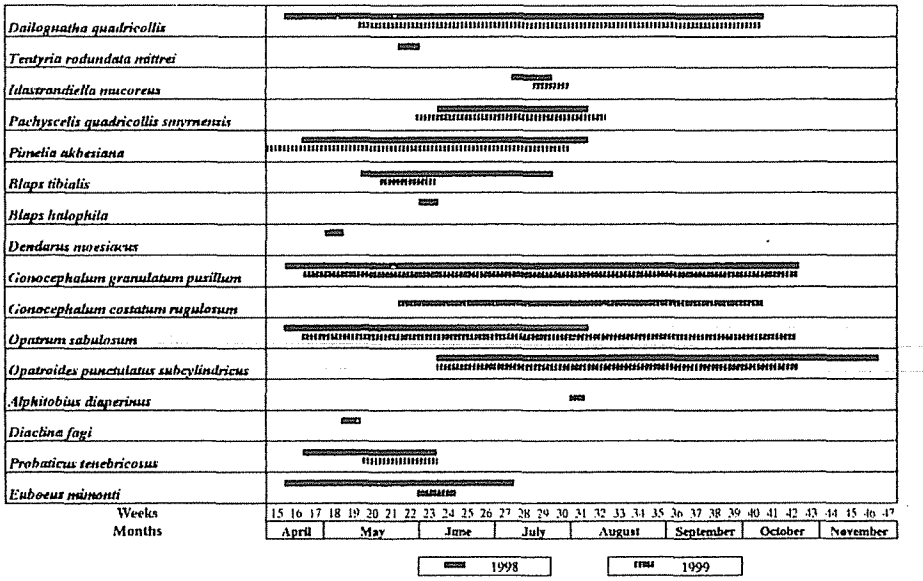

Figure 1. Occurrence of the studied species during the period between 1998 and 1999.

There are some differences among these three localities by means of species index, Simpson index and Shannon index (Table 2). Species indices were 4, 9 and 12 in 1998 and 7, 6, 9 in 1999 for the localities of Manisa, Ören and Armutlu, respectively. Armutlu has the richest faunal element in both years compared to the others. Each of the Simpson and Shannon indices of diversity showed a little increase from 1998 to 1999 in Manisa like species index; however the Simpson and Shannon indices of diversity decreased in Ören and Armutlu in the same period. When the two indices were compared for Ören and Armutlu, it was found that the Simpson and Shannon indices of Armutlu is bigger than that of Ören and that fits the change in species index. Some differences observed among diversity indices both in the three localities and in the years of 1998 and 1999. It is thought that, differences in climatic factors, surface vegetation and some agricultural practices may affect activity and density as well as the diversity of fauna.

In this study, 16 tenebrionid species have been determined for the first time in ecological cherry orchards. Neither those species nor other tenebrionids have been reported from conventional or integrated cherry orchards up to now by recent studies conducted by Ulu et al. (1995), Özbek et al. (1996), Ulusoy et al. (1999) and Özder (1999).

It is obvious that the enrichment of fauna is due to the application of ecological agriculture in cherry orchards and avoidance of usage of pesticides and

other chemicals. In addition, low external intervention facilitates species enrichment in these balanced ecosystems. Although observations on destruction of tenebrionids have not been made in orchards of cherry trees, their occurrence and abundance is important from an ecological and environmental point of view. If it is needed, some observations and studies on their role in cherry orchards can be planed in future researches.

Table 2. List of tenebrionid species and their total number of individuals collected in 3 ecological cherry orchards by pitfall traps in 1998 and 1999 and their evaluation by species, Simpson and Shannon indices

Species	Total trapped							
	1998				1999			
	Manisa	Ören	Armutlu	Total	Manisa	Ören	Armutlu	Total
Dailognatha quadricollis	3	51	39	93	72	99	57	228
Tentyria rodundata mittrei		1		1				0
Idastrandiella mucoreus			6	6			2	2
Pachyscelis quadricollis smyrnensis				4	4	5		
Pimelia akbesiana	2	1	6	9	2		227	229
Blaps tibialis		4	5	9			5	5
Blaps halophila			1	1				0
Dendarus moesiacus			1	1				0
Gonocephalum granulatum pusillum	15	56	117	188	3	84	54	141
Gonocephalum costatum rugulosum					0	1	2	
Opatrum sabulosum			12	12	6	1	9	16
Opatroides punctulatus		2	9	11	15	6	4	25
Diaclina fagi		1		1				0
Probaticus tenebricosus		1	1	2		1	2	3
Euboeus mimonti	1	4	11	16			2	2
Species index	4	9	12		7	6	9	
Simpson index (S)	0,48	0,61	0,65		0,50	0,55	0,56	
Shannon index (H)	0,39	0,51	0,66		0,46	0,40	0,50	

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Özet

İzmir ve Manisa illeri ekolojik kiraz üretim bahçelerinde bulunan Tenebrionidae (Coleoptera) familyası türleri üzerinde bir değerlendirme

1998 ve 1999 yıllarında ekolojik kiraz üretimi yapılan Manisa (Merkez-Muradiye) (38° 39' K / 27° 20' D), İzmir (Kemalpaşa-Ören) (38° 28' K / 27° 36' D) ve İzmir (Kemalpaşa-Armutlu) (380 25' K / 27° 32' D)' daki bahçelerde yürütülen bu çalışmayla Tenebrionidae familyasına bağlı türlerin ortaya konması amaçlanmıştır. Bu amaçla çukur ve besin tuzakların yanı sıra darbe yöntemiyle de örnekler toplanmıştır. Çalışma sonunda toplam 16 tür saptanmış olup, bunlar ***Dailognatha quadricollis*** Brullé, ***Tentyria rodundata mittrei*** Solier, ***Idastrandiella mucoreus*** Waltl, ***Pachyscelis quadricollis smyrnensis*** Kraatz, ***Pimelia akbesiana*** Fairmaire, ***Blaps tibialis*** Reiche, ***Blaps halophila*** Fischer, ***Dendarus moesiacus*** Mulsant & Rey, ***Gonocephalum granulatum pusillum*** Fabricius, ***Gonocephalum costatum rugulosum*** Küster, ***Opatrum***

sabulosum Linnaeus, ***Opatroides punctulatus subcylindricus*** Brullé, ***Alphitobius diaperinus*** Panzer, ***Diaclina fagi*** (Panzer), ***Probaticus tenebricosus*** Brullé ve ***Euboeus mimonti*** Boildieu'dir. Bu türlerden P***achyscelis quadricollis smyrnensis*** ve ***Pimelia akbesiana'*** nın endemik; ***Gonocephalum granulatum pusillum, Dailognatha quadricollis*** ve ***Pimelia akbesiana***' nın da en bol bulunan türler olduğu belirlenmiştir. Ayrıca 3 farklı bahçeden 2 yıl boyunca toplanan materyal, Simpson, Shannon ve tür indeksleri kullanılmak suretiyle karşılaştırma yoluna gidilmiştir.

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