الخنافس الرواغة (Coleoptera: Staphylinidae) في ثلاثة حقول تبغ في جنوب سورية

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الملخص

تم حصر الخنافس الرواغة (Staphilinidae) في ثلاث مناطق زراعية، مزرعة أبو جرش في دمشق، وتقع المزرعتين في (الكوم وخان أرنبة) في محافظة القنيطرة خلال 2016 و 2017. تم تقدير التنوع البيولوجي للخنافس المدروسة باستخدام مصائد الـ Pitfull. تم خلال عملية المسح عن الخنافس الرواغة جمع 614 عينة، وتحديد 19 جنس و22 نوع. تبين من خلال الدراسة أن النوعين *Lobrathium sp.*، *P latystethus cornutus* هما السائدين، حيث كانت نسبتهما 30.61% من مجموع الخنافس الرواغة التي تم جمعها. كما تبين أن لطبيعة الأرض المزروعة تأثير هام في عدد وتركيب الأنواع الموجودة.

الكلمات المفتاحية: الخنافس الرواغة، Staphilinidae، *Lobrathium* sp.، *Platystethus cornutus*، سورية.

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The Rove Beetles (Coleoptera : Staphylinidae) of Three Tobacco Fields in South of Syria

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Abstract

Rove beetles (Staphylinidae) were surveyed across three horticultural farms, Abo Jarash in Damascus, the two other farms (Alkawm and Khan Arnabah) are located in (Alqounaitra province) in the season 2016 and 2017. Their biodiversity was estimated using pitfall traps. A total of 614 specimens , 19 genera and 22 species were collected during the survey. The rove beetle assemblage displayed the dominance of Lobrathium sp., Platystethus cornutus, their percentage is 30.61% of all species. Land use seemed to have a significant effect on the number and composition of the species.

Key words: Rove beetles, Staphylinidae, Lobrathium sp., Platystethus cornutus, Syria.

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Introduction

Rove beetles are members of the Staphylinidae family (Coleoptera: Staphylinidae), primarily distinguished by their short elytra (wing covers) that typically leave more than half of their abdomens exposed. There are 47,744 species in 3,847 genera of 31 subfamily (Herman,2001). About 400 new species are being described each year, and some estimates suggest three-quarters of tropical species are as yet undescribed (Arnett *et al*,2000; Frank and Ahn,2011). Rove beetles are known from every type of habitat in which beetles occur (Bohac,1999), and their diets include just about everything except the living tissues of higher plants. Most rove beetles are predators of insects and other invertebrates, living in forest leaf litter and similar kinds of decaying plant matter. They are also commonly found under stones, and around freshwater margins (Frank and Ahn,2011). Rove beetles can be considered biological indicators of the environmental status, particularly of the human influence on ecosystems because of their immense diversity, not only in species, but also in potential habitats and feeding habits (Buse and Good, 1993; Bohac, 1999). There are several studies about the fauna of the rove beetles in the world. The British List comprises about 1000 species of which 628 are reliably reported from Ireland. The group is not as well studied in Ireland as Britain, however, so the current list of species is probably a sizeable underestimate of true biodiversity (Anderson,1997).

Dominance and distributions of rove beetles in apple and pear orchards were studied in Hungary (Balog & Victor,2006). *Omalium caesum*, *Sphenoma abdominale*, *Drusilla canaliculata*, *Palporus nitidulus*, *Dexiogyia corticina*, *Mocyta orbata*, *Oligota pumilio* and *Purrolinus laeticeps* were the species usually found with higher relative abundance in staphylinid communities in orchard. Although these species occurred in most of the orchards, their abundance varied considerably and their relative abundance in the total sample was under nine percent (Balog and Victor,2006).

According to Anlas (2009) there are 1600 staphylinid species in Turkey which belong to their 346 Staphylininae subfamily. Staphylinidae fauna isn't researched in Syria. The aim of the present study is to determine the Staphylinidae fauna in some tobacco fields of Syria during 2016 and 2017.

Material and Methods

Study area and study sites

Samples were taken from three tobacco fields, the first one is Khan Arnabah, the second is Alkawm, and two farmes are located in (Alqounaitra province), and conventionally managed, The other in Abo Jarash (Damascus city) and biologically managed. They are all small fields inserted in a periurban contest, and water supplied by Drip irrigation system.

The first tobacco field (Khan Arnabah) is surrounded by strips of cultivated lands and cereal cultivated fields, the second (Alkawm) is surrounded by houses with strips of cultivated lands and cereal cultivated fields

The third (Abo Jarash) borders with the town and vegetables fields. More characteristic of each farm are listed in Table 1.

Table (1): Main characteristics of the farms.

Location	Khan Arnabah	Alkawm	Abo Jarash
GPS coordinates	N 33° 11'02.17 E 35° 53'21.21	N 33° 11'59 E 35° 54'59	N 33° 32'28.52 E 36° 19'08.76
Area Total	2 ha	1 ha	0.5 ha
Area in Tunnel	0.5 ha	0.5 ha	0.3 ha
Surrounding crops	Corn Aubergine Tomato Lettuce Sweet pepper —	Corn Tomato Sweet pepper — — —	Cabbage Beans Tomato Marrow Aubergine Sweet pepper
Trees	Olive Apple trees Fig trees —	Fig trees Olive Apple trees —	Pomegranate Figs Olive Apricot

	—	—	Apple trees
Shrub	Avena sp.	Avena sp.	Oriental tannins
	Brassica oleracea	Brassica oleracea	Hordeum sp.
	Cirsium syriacum	Sinapis alba	Avena sp.
	Sisymbrium officinale	Cirsium syriacum	Brassica oleracea
	Aromatic plants	Sisymbrium officinale	Galium aparine
	—	Aromatic plants	Blackberry
	—	—	Aromatic plants
	—		
Chemical plant protection	Chemical protection	Chemical protection	According to official recommendation
	No weed control	No weed control	Weed control

Sampling

Rove beetles were surveyed from April through August every year of study. They were sampled using pitfall traps (7 cm diameter, 10 cm deep) covered with a pantile and filled with vinegar to attract the beetles and salt to preserve fermentation. Four traps were set on the four side of each farm, between tunnel in uncultivated strips of land. They were examined fortnightly. The laboratory work has been conducted at the Biological Control Studies and Research Center Laboratories, (BCSRC), Faculty of Agriculture, Damascus University, Syria. Samples were washed through a fine sieve in the laboratory. Adult Staphylinidae were separated and identified to species level and sorted to trophic groups according to their feeding type and to ecological groups according to their macro and microhabitat preferences.

The systematic nomenclature of (Smetana, 2004) is adopted. Division in subfamilies is the one of (Newton and Thayer, 1992). The dominance rate (DR) was applied and the species detected were classified in relation to their percentage as against the entire rangeas:

- subrecedent (subrec): less than 1.0%
– rare recedent (rec): 1.0% - 2.0%
– fairly numerous subdominant (subdom): 2.1% - 5.0%
– numerous dominant (dom): 5.1% - 10.0%
– very numerous eudominant (eudom): over 10.0%

Results and Discussion

A total of 614 specimens were captured. Some of them were classified and some were discarded which were'nt suitable for classification. Classification was conducted at the Biological Control Studies and Research Center Laboratories (BCSRC) by Dr. Abdulnabi Basheer (Department of plant protection). A total of genera and species were collected during the survey (Table 2-3) distributed in the fields as in Table 4-5-6. The most common staphylinid species (eudominant species) are *Lobrathium* sp., *Platystethus cornutus,* they contribute 30.61% of all species.

Table (2) : Rove beetles caught in the three fields

	First year	Second year	Total
Abo Jarash	119	202	321
Alkawm	69	115	184
Khan Arnabah	43	66	109
TOTAL	231	383	614

Table (3) : Species recorded and relative percentage in the whole period of study.

	Total	Relative%
Staphylininae		
Cafius luteipennis (Horn, 1884)	35	5.7
Ocypus olens (Müller, 1764)	19	3.09
Othius punctulatus (Goeze, 1777)	47	7.65
Heterothops stiglundbergi (Israelson, 1979)	7	1.14

Oxytelus piceus (Linnaeus, 1767)	3	0.48
Phacophallus parumpunctatus (Gyllenhal, 1827)	36	5.86
Platydracus sp.	21	3.42
Xantholinus linearis (Olivier, 1795)	13	2.11
Xantholinus elegans (Olivier, 1795)	39	6.35
Paederinae		
Achenium depressum (Gravenhorst, 1802)	5	0.81
Achenium humile (Nicolai, 1822)	20	3.25
Lobrathium sp.	77	12.54
Rugilus orbiculatus (Paykull,1789)	17	2.76
Euaesthetinae		
Euaesthetus sp.	16	2.6
Oxytelinae		
Anotylus inustus (Gravenhorst, 1806)	56	9.12
Bledius monstratus (Casey, 1889)	21	3.42
Bledius erraticus (Erichson, 1839)	5	0.81
Platystethus cornutus (Gravenhorst, 1802)	111	18.07
Oxyporinae		
Oxyporus femoralis	37	6.02
Scaphidiinae		
Cyparium sp.	2	0.32
Xantholininae		

Nudobius lentus (Gravenhorst, 1806)	16	2.6
Aleocharinae		
Eumicrota sp.	11	1.79

Table(4): Khan Arnabah. species recorded, distribution and relative percentage

	First year	Second year	Total	Relative%
Staphylininae				
Cafius luteipennis (Horn, 1884)	3	4	7	6.42
Othius punctulatus (Goeze, 1777)	2	6	8	7.33
Phacophallus parumpunctatus (Gyllenhal, 1827)	3	6	9	8.25
Platydracus sp.	2	3	5	4.58
Xantholinus elegans (Olivier, 1795)	2	5	7	6.42
Paederinae				
Achenium humile (Nicolai, 1822)	1	4	5	4.58
Lobrathium sp.	5	9	14	12.84
Euaesthetinae				
Euaesthetus sp.	3	1	4	3.66
Oxytelinae				
Anotylus inustus (Gravenhorst, 1806)	6	7	13	11.92
Bledius monstratu (Casey, 1889)	1	2	3	2.75
Platystethus cornutus (Gravenhorst, 1802(	9	11	20	18.34
Oxyporinae				
Oxyporus femoralis	4	5	9	8.25
Xantholininae				
Nudobius lentus (Gravenhorst, 1806)	2	3	5	4.58

Table (5): Alkawm. species recorded, distribution and relative percentage

	First year	Second year	Total	Relative %
Staphylininae				
Cafius luteipennis (Horn, 1884)	2	7	9	4.89
Othius punctulatus (Goeze, 1777)	4	11	15	8.15
Heterothops stiglundbergi (Israelson, 1979)	3	1	4	2.17
Phacophallus parumpunctatus (Gyllenhal, 1827)	5	9	14	7.60
Platydracus sp.	5	7	12	6.52
Xantholinus elegans	3	6	9	4.89
Paederinae				
Achenium humile (Nicolai, 1822)	2	5	7	3.80
Lobrathium sp.	8	13	21	11.41
Euaesthetinae				
Euaesthetus sp.	3	3	6	3.26
Oxytelinae				
Anotylus inustus (Gravenhorst, 1806)	8	10	18	9.78
Bledius monstratus	3	5	8	4.34
Bledius erraticus	1		1	0.54
Platystethus cornutus (Gravenhorst, 1802)	11	18	29	15.76
Oxyporinae				
Oxyporus femoralis	6	9	15	8.15
Scaphidiinae				
Cyparium sp.	1		1	0.54
Xantholininae				
Nudobius lentus (Gravenhorst, 1806)	1	3	4	2.17
Aleocharinae				
Eumicrota sp.	3	8	11	5.97

Table (6) Abo Jarash. species recorded, distribution and relative percentage

	First year	Second year	Total	Relative %
Staphylininae				
Cafius luteipennis (Horn, 1884)	3	16	19	5.91
Ocypus olens	6	13	19	5.91
Othius punctulatus (Goeze, 1777)	5	19	24	7.47
Heterothops stiglundbergi (Israelson, 1979)	3		3	0.93
Oxytelus piceus (Linnaeus, 1767)	1	2	3	0.93
Phacophallus parumpunctatus (Gyllenhal, 1827)	4	9	13	4.04
Platydracus sp.	3	1	4	1.24
Xantholinus linearis (Olivier, 1795)	11	2	13	4.04
Xantholinus elegans	8	15	23	7.16
Paederinae				
Achenium depressum (Gravenhorst, 1802)	3	2	5	1.55
Achenium humile (Nicolai, 1822)	1	7	8	2.49
Lobrathium sp.	15	27	42	13.08
Rugilus orbiculatus (Paykull,1789)	6	11	17	5.29
Euaesthetinae				
Euaesthetus sp.	1	5	6	1.86
Oxytelinae				
Anotylus inustus (Gravenhorst, 1806)	11	14	25	7.78
Bledius monstratus	2	8	10	3.11
Bledius erraticus	1	3	4	1.24
Platystethus cornutus (Gravenhorst, 1802)	25	37	62	19.31
Oxyporinae				
Oxyporus femoralis	7	6	13	4.04
Scaphidiinae				
Cyparium sp.	1		1	0.31
Xantholininae				
Nudobius lentus	2	5	7	2.18

In the present study, *P. cornutus*, a species very common and ubiquitous, covered 18.07% of all of samples , and 19.3% in farm (Abo Jarash), 15.76% in the second farm (Alkawm), while it was 18.34 in the third farm (Khan Arnabah). Maximum number of

captures was concentrated in summer (June, July and late August 2016 and 2017). The species are most commonly found in dung and other decaying plant materials (LÜ and Zhou, 2015).

Lobrathium sp. covered 12.45% of samples, and 13.08% in (Abo Jarash) farm, 11.41% in (Alkawm) farm and 12.84% in (Khan Arnabah) farm. Maximum captures occurred in summer (June and July and late August In the study period) . The species are most commonly found in dung and other decaying plant materials (Assing, 2012).

Anotylus inustus covered 9.12% of samples, and 7.78% in farm (Abo Jarash), 9.78% in farm (Alkawm) while it was 11.92% in farm (Khan Arnabah). Maximum captures occurred in May and October in the time of study. The species is predator on Aphid insects, and maximum captures occurred in spring.

Othius punctulatus covered 7.65% of samples, and 7.47% in farm (Abo Jarash), 8.15% in (Alkawm) farm and 7.33% in (Khan Arnabah) farm. The species was collected in leaf litter during winter.

Xantholinus elegans covered 6.35% of samples, and 7.16% in farm (Abo Jarash), 4.89% in (Alkawm) farm and 6.42% in (Khan Arnabah) farm. The species was collected with soil from the collection site during April - June.

Oxyporus femoralis covered 6.02% of samples, and 4.04% in farm *(*Abo Jarash*)*, 8.15% in farm (Alkawm) while it was 8.25% in (Khan Arnabah) farm. The species is fungivore, his whole lifecycle involves fungi, as females construct egg-laying chambers in fungi and reproduce in them (Newton *et al*,2001).

Phacophallus parumpunctatus the overall percentage of this species was 5.86%. It covered 4.04% in farm (Abo Jarash), 7.60% in farm (Alkawm) while it was 8.25% in (Khan Arnabah) farm. It was collected in manure, from rotting plant debris, in wet habitats, and its flying at dusk (Peck,2009).

Cafius luteipennis The overall percentage of this species was 5.70%. It covered 5.91% of samples *in* farm (Abo Jarash), 4.89 *%* in farm (Alkawm) while it was 6.42% in (Khan Arnabah) farm. The adult of this spesies was found under sand from the collection site (James *et al*,1971).

Platydracus sp. and *Bledius monstratus* the overall percentage of these species was 3.42% each. *Platydracus sp.* covered 1.24% of samples in farm (Abo Jarash), 6.52% in farm (Alkawm) and 4.58% in (Khan Arnabah) farm. It found typically, under rocks and logs in field habitats (Brunke *et al*,2011).

Bledius monstratus covered 3.11% in farm (Abo Jarash), 4.34% in farm (Alkawm) and 2.75% % in (Khan Arnabah) farm. It found typically, under rocks and logs in field habitats (Frank and Ahn,2011).

Achenium humile the overall percentage is 3.25%. It covered 2.49% in farm (Abo Jarash), 3.80% in farm (Alkawm) and 4.58% in (Khan Arnabah) farm. This species is predatory and lives in broad- leaved woodlands, fields, sand dunes, coastal marshes and alluvial flats (Hyman and Parsons 1994). It takes advantage of habitats under bark on dead wood, under stones, among mosses, at roots of grasses, muddy dykes and clay banks (Hyman and Parsons 1994).

Ocypus olens the overall percentage of this species was 3.09%. It covered 5.91% of samples in farm (Abo Jarash), while it was never detected in the farm (Alkawm) and (Khan Arnabah) farm. This beetle is found in Abo Jarash farm, where it relies on decaying natural matter. The species is a beneficial insect playing an important role in the food chain as a dominant predator, ensuring that nutrients are recycled and returned to the soil. (Hyman and Parsons 1994).

Rugilus orbiculatus the overall percentage is 2.76%. It covered 5.29% in farm (Abo Jarash), while it was never detected in the farm (Alkawm) and (Khan Arnabah) farm. This species occurs in most

types of decaying organic matter, such as compost and grass heaps, rotting hay and straw, old mushrooms, hay stacks, leaves and especially in leaf litter and other debris around water and damp habitats. Adults are found throughout the year (Hoebeke,1995).

Euaesthetus sp. The overall percentage is 2.60%. It covered 1.86% in farm (Abo Jarash), 3.26% in farm (Alkawm) and 3.66% in (Khan Arnabah) farm. This species occurs in mainly plant leaf litter (Arnett *et al*,2002).

Nudobius lentus The overall percentage is 2.60%. It covered 2.18% in farm (Abo Jarash), 2.17% in farm (Alkawm) and 4.58% in (Khan Arnabah) farm. This species is a predator feeds on borers, and it was founded in nests and burrows of different animal and in anthills (Skrzecz and Bulka,2010).

Xantholinus linearis The overall percentage is 2.11%. It covered 4.04% in farm (Abo Jarash), while it was never detected in the farm (Alkawm) and (Khan Arnabah) farm. This species occurs in various kinds of decaying organic matter (e.g. dung, compost, and rotting plants). It has been found in gardens, farmland, disturbed areas, debris around farmhouses, leaf litter, moss, under stones and boards and in low vegetation (Smetana, 1982؛ Brunke and Majka, 2010).

Heterothops stiglundbergi The overall percentage is 1.14%. It covered 0.93% in farm (Abo Jarash), 2.17% in farm (Alkawm), while it was never detected in farm (Khan Arnabah).

Eumicrota sp. The overall percentage is 1.79%. It covered 5.97% in farm (Alkawm), while it was never detected in the farms (Abo Jarash) and (Khan Arnabah). Frank (2009) recorded that Eumicrota sp. attacks cultivated mushrooms in Florida.

Achenium depressum and Bledius erraticus covered 0.81% each. Oxytelus piceus covored 0.48%. and Cyparium sp. covered 0.32%.

Table (7): Distribution of the species in dominant rate categories

	Khan Arnabah	Alkawm	Abo Jarash
Eudominant	*Lobrathium sp* *Anotylus inustus* *Platystethus cornutus*	*Lobrathium sp.* *Platystethus cornutus* —	*Lobrathium sp.* *Platystethus cornutus* —
Dominant	*Cafius luteipennis* *Othius punctulatus* *Phacophallus parumpunctatus* *Xantholinus elegans* *Oxyporus femoralis* —	*Othius punctulatus* *Phacophallus parumpunctatus* *Platydracus sp.* *Anotylus inustus* *Oxyporus femoralis* *Eumicrota sp.*	*Cafius luteipennis* *Ocypus olens* *Othius punctulatus* *Xantholinus elegans* *Rugilus orbiculatus* *Anotylus inustus* —
Subdominant	*Platydracus sp.* *Achenium humile* *Euaesthetus sp* *Bledius monstratus* *Nudobius lentus* —	*Cafius luteipennis* *Heterothops stiglundbergi* *Xantholinus elegans* *Achenium humile* *Euaesthetus sp* *Bledius monstratus* *Nudobius lentus*	*Nudobius lentus* *Bledius monstratus* *Oxyporus femoralis* *Achenium humile* *Xantholinus linearis* *Phacophallus parumpunctatus* —
Recedent	— — — —	— — — —	*Platydracus sp* *Achenium depressum* *Bledius erraticus* *Euaesthetus sp.*

Table (8):Main characteristics of the species detected

	Feeding group
Staphylininae	
Cafius luteipennis (Horn, 1884)	predator
Ocypus olens (Müller, 1764)	Saprophagous
Phacophallus parumpunctatus (Gyllenhal, 1827)	predator
Othius punctulatus (Goeze, 1777)	predator
Platydracus sp.	predator
Xantholinus elegans (Olivier, 1795)	predator
Xantholinus linearis (Olivier, 1795)	Predator
Heterothops stiglundbergi (Israelson, 1979)	predator
Oxytelus piceus (Linnaeus, 1767)	saprophagous
Xantholininae	
Nudobius lentus (Gravenhorst, 1806)	predator
Aleocharinae	
Eumicrota sp.	Fungivore

Paederinae
Rugilus orbiculatus (Paykull, 1789)
Achenium depressum (Gravenhorst, 1802)
Achenium humile (Nicolai, 1822)
Lobrathium sp.
Euaesthetinae
Euaesthetus sp.
Oxytelinae
Anotylus inustus (Gravenhorst, 1806)
Bledius monstratus (Casey, 1889)
Bledius erraticus (Erichson, 1839)
Platystethus cornutus (Gravenhorst, 1802)
Oxyporinae
Oxyporus femoralis
Scaphidiinae
Cyparium sp.

GENERAL DISCUSSION

Most of the species detected have already been recorded as frequent in other agricultural fields In the world (Obrtel, 1968; Daccordi and Zanetti, 1989; Krooss and Schaefer, 1998). Many of them live on decaying matters, as it is really simple to find fruit or vegetable abandoned on the soil in or on which they can develop. Many of the species detected are good flyers (e.g., species of the genera *Oxytelus*, *Platystethus*), and consequently, have high potential for recolonization of disturbed habitats. Remarkable is the fact that in (Abo Jarash) farm the number of species detected is really higher than in the conventional two (Alkawm) and (Khan Arnabah) farms. There are also much more species linked to meadows or uncultivated lands which probably represent the bases of rove beetles repopulation in agroecosistem and which are mostly predators.

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