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Entomofauna investigations in the apricot orchards, *Prunus armeniaca* L. (Rosales Rosaceae), in Ouled Si Slimane, Batna, North East Algeria

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ABSTRACT

Researches carried out in the past years allowed to list an entomofauna that lives on the apricot orchards, *Prunus armeniaca* L. (Rosales Rosaceae), in Ouled Si Slimane (Batna Department, Algeria). The investigated period was from October 2014 until May 2015. The sampling techniques used were: hunting in sight, barber pots, colorful traps, entomological umbrella and the filleting net. We have identified a total of 125 species divided into 9 orders and 54 families in which Coleoptera and Hymenoptera were quantitatively represented. The phytophagous were the most present. Its Shannon Value exceeds 4.5 Bits and indicates a Specific Richness of the insects and diversification of ecological niches in this kind of fauna.

KEY WORDS Apricot; entomofauna; orchard; Coleoptera; Hymenoptera.

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INTRODUCTION

In Algeria, apricot cultivation, *Prunus armeniaca* L. (Rosales Rosaceae), is distributed in coastal plains, Tellian Atlas, high plateaus, pre-desert areas and Saharan Oases (Chafaa, 1992). The apricot's pests are few and rarely specific. Their population varies significantly in space and time (Chafaa, 1992). According to Vidaud (1980), these pests are generally classified according to their level of attack. The root, neck, trunk and branch pests are represented by several species (Hariri, 1978; Bretaudeau, 1979; Malek, 1987).

Due to the economic and social importance of apricot, its culture has been the subject of research and experimentation for years to improve its productivity.

In Algeria, some works are published on the apricot: Chaouia (1987), on the varietal behaviour of the species in the Boufarik experimental station (Blida Department), Bouzidi (1990) in Batna Department, Derias (1984), Benabbes (1990) and Achourri (1991) in the region of Ain Touta and on apricot berry dieback in the N'Gaous region, Chafaa (1992) in the region of Ouled Si Slimane on the ecological biology of apricot zoocoenosis. Numerous are the publications on this subject also in other countries (see, for example: Ivanova, 1991, 2006; Dér et al., 2003; Bonsignore et al., 2008).

This work has the main objective to highlight apricot entomofauna subservient to the agro-systems in Ouled Si Slimane orchards. Thus, we aim in our study to know the bio-ecological status of the different insect groups: abundance, diversity and diet.

MATERIAL AND METHODS

Our study was conducted in an apricot orchard in the Kochbi region located about 5 km from Ouled Si Slimane city (Lat. 35°36’39”N, Long. 5°37’58”E). This region is 90 km from Batna department, in north east Algeria. The climate of the study area during the period 1985–2014 was characterized by a total average precipitation of 251.59 mm, the average temperature varied between 0.03°C in January and 36.75° C in July. The study area is in an arid bioclimatic stage with cool winters.

This orchard, of one hectare of surface, was installed in 1992 and includes a total of about 100 trees of apricot variety of Louizi or “Louzired” . The trees are cultivated in semi-intensive form with 6m x 6m spacing; each tree measures 3 m in height. Soil is a clay-silty texture and it is irrigated by a channel. In addition, fertilization of the soil with farm manure is carried out during the period from December to January, the weed control applied is mechanical in the cuvettes and the orchard does not undergo any phytosanitary treatment.

The study of the entomofauna was carried out between October 2014 to May 2015. We have adopted a qualitative sampling (classical hunting) (Colas, 1974) and a quantitative sampling using different methods: striking (Fauvel et al., 1981), trapping (colored traps, Barber pots, etc.) and mowing (Benkhelil, 1991).

Samples were kept at the laboratory in petri dishes or in labelled flasks. They were checked under the binocular microscope for the sorting and counting and they were determined using morphological characters. The determination was made using various identification keys: Perrier (1964), Chopard (1943), Severa (1988), Berland (1999), Dierl & Ring (2009), Bouragba (2010), and Aguib (2014).

The indexes used to examine the bio-ecological status of the different insect groups in the apricot orchard during the study period (Magurran, 2004), were: Abundance frequency (FA) has been calculated for each order by the percentage of individuals in relation to the total (N) recorded in the orchard, Species richness (S), Shannon’s diversity index (H’), and Evenness (E).

RESULTS AND CONCLUSIONS

The results on the entomofauna sampled in the study area are shown on Table 1 with its numbers (ni) and its abundance frequencies (FA%) depending on the species. All species are classified according to their taxonomic membership and diet (D).

The insect inventory has identified a total of 125 species belonging to 9 orders and 54 families with a total of 4,170 individuals (Table 1). Similar results were obtained by Naceri (2011) in an olive grove in Batna with a total of 156 species and 1528 specimens belonging to 16 orders and 80 families. Chafaa (2013) recorded in three olive groves in the region of Batna 206 species of insects with a total of 2311 specimens belonging to 11 orders and 74 families.

The species *Henicopus* sp., from the Dasytidae family (Coleoptera), is considered the most abundant species in our orchard with an abundance frequency of abundance of 42.45%, followed by *Cataglyphis bicolor* of the Formicidae family (Hymenoptera) with a frequency of abundance of 5.18%. Several authors show the dominance of Coleoptera in the region of Batna: Kellil (2010) in cereal fields, Zireg (2011) in a juniper forest, and Naceri (2011) in an olive grove. Guettala-Frah (2009) shows the dominance of Coleoptera (38%) in an apple orchard in the Aurès region (Batna Department).

Among the species recorded, we have the presence of 4 species protected by regulations in Algeria (Decree No. 83-509 of 20/08/1983) related to non-domestic animal species. These species are: *Coccinella septempunctata*, *Apis mellifera*, *Cataglyphis bicolor*, and *Polistes gallicus*.

The diversity parameters calculated for the different types of the diet are recorded in Table 2. According to the results, we note a dominance of phytophagous with 71 species, followed by predators with 31 species and polyphagous with 13 species. We report a very low number of saprophagous (5), parasites (4) and coprophagous (1) species.

Phytophagous insects are very selective for plant species that they prefer. All parts of the plant can be attacked by xylophagous, frondicultural, radicicols, Saproxylic, and floricols insects (Villiers, 1979; Ricklefs & Miller, 2005).

Families	Species	D	Ni	FA(%)
Blattoptera				
Blattidae	*Blatta orientalis*	Pol	4	0.10
Coleoptera				
Aphodiidae	*Aphodius* sp.	Cop	1	0.02
Buprestidae	*Acmaeoderella discoidea*	Phy	44	1.06
Buprestidae	*Capnodis tenebrionis*	Phy	2	0.05
Buprestidae	*Perotis unicolor*	Phy	1	0.02
Cantharidae	*Cantharis* sp.	Pre	5	0.12
Cantharidae	*Cantharis* sp 1	Pre	4	0.10
Carabidae	*Amara* sp. 1	Pre	2	0.05
Carabidae	*Amara* sp. 2	Pre	4	0.10
Carabidae	*Calathus fuscipes algiricus*	Pre	64	1.53
Carabidae	*Calathus* sp.	Pre	1	0.02
Carabidae	*Carabus* sp.	Pre	2	0.05
Carabidae	*Lebia trimaculata*	Pre	1	0.02
Cetoniidae	*Aethiessa floralis*	Phy	3	0.07
Cetoniidae	*Cetonia funeraria*	Phy	4	0.10
Cetoniidae	*Tropinota hirta*	Phy	12	0.29
Chrysomelidae	*Chrysolina* sp.	Phy	3	0.07
Chrysomelidae	*Cryptocephalus rugicollis*	Phy	1	0.02
Chrysomelidae	*Entomoscelis rumicis*	Phy	6	0.14
Chrysomelidae	*Oulema melanopus*	Phy	9	0.22
Cleridae	*Trichodes alvearius*	Phy	6	0.14
Coccinellidae	*Coccinella septempunctata*	Pre	4	0.10
Curculionidae	*Hypera postica*	Phy	1	0.02
Curculionidae	*Larinus* sp. 1	Phy	1	0.02
Curculionidae	*Larinus* sp. 2	Phy	9	0.22
Curculionidae	*Lixus* sp.	Phy	5	0.12
Curculionidae	*Plagiographus excoriatus*	Phy	3	0.07
Curculionidae	*Rhytidoderes plicatus*	Phy	2	0.05
Curculionidae	*Scolytus rugulosus*	Phy	15	0.36
Dasytidae	*Henicopus* sp.	Phy	1770	42.45
Geotrupidae	*Geotrupes* sp.	Sap	3	0.07
Meloidae	*Mylabris schreibersi*	Phy	1	0.02
Meloidae	*Mylabris* sp.	Phy	1	0.02
Melolonthidae	*Amphimallon* sp.	Phy	1	0.02
Melolonthidae	*Rhizotrogus pallidipennis*	Phy	6	0.14
Melolonthidae	*Rhizotrogus* sp.	Phy	7	0.17
Scarabaeidae	Scarabaeidae	Phy	1	0.02
Staphylinidae	*Othinus punctulatus*	Pol	2	0.05
Staphylinidae	*Philonthus politus*	Pol	1	0.02
Staphylinidae	*Staphylinus* sp.	Pol	9	0.22
Tenebrionidae	*Adesmia faremonti*	Pre	1	0.02
Tenebrionidae	*Omophlus* sp.	Pre	3	0.07

Families	Species	D	Ni	FA(%)
Tenebrionidae	*Sepidium variegatum*	Sap	3	0.07
Tenebrionidae	*Tentyria* sp.	Sap	1	0.02
Tenebrionidae	*Tentyria thunbergi*	Sap	2	0.05
Tenebrionidae	*Tribolium* sp.	Sap	2	0.05
Dermaptera				
Forficulidae	*Forficula auricularia*	Pol	1	0.02
Diptera				
Anthomyiidae	*Delia radicum*	Pre	1	0.02
Asilidae	*Asilus* sp.	Pre	1	0.02
Bombyliidae	*Bombylius major*	Pre	19	0.46
Calliphoridae	*Calliphora vomitoria*	Pol	1	0.02
Calliphoridae	*Lucilia caesar*	Pol	11	0.26
Culicidae	*Culex pipiens*	Pol	28	0.67
Muscidae	*Musca domestica*	Pol	562	13.48
Sarcophagidae	*Sarcophaga carnaria*	Pre	96	2.30
Syrphidae	*Scaeva pyrastri*	Pre	1	0.02
Syrphidae	*Syrphus* sp.	Pre	100	2.40
Tachinidae	*Gymnosoma rotundatum*	Pol	1	0.02
Tachinidae	*Phryxe vulgaris*	Pol	12	0.29
Tachinidae	*Tachina fera*	Pol	4	0.10
Tachinidae	*Tachinus* sp.	Pol	12	0.29
Hemiptera				
Anthocoridae	*Anthocoris* sp.	Phy	80	1.92
Cicadellidae	*Iassus lanio*	Phy	38	0.91
Cicadidae	*Cicada* sp.	Phy	3	0.07
Cicadidae	*Cicadetta* sp.	Phy	4	0.10
Pentatomidae	*Pentatomidae* sp.	Phy	1	0.02
Reduviidae	*Reduvius personatus*	Phy	1	0.02
Rhopalidae	*Corizus* cf. *hyoscyami*	Phy	1	0.02
Scutelleridae	*Eurygaster maura*	Phy	1	0.02
Homoptera				
Aphididae	*Macrosiphum rosa*	Phy	2	0.05
Aphididae	*Myzus persicae*	Phy	1	0.02
Aphididae	*Myzus* sp.	Phy	5	0.12
Hymenoptera				
Apidae	*Apis mellifera*	Phy	272	6.52
Apidae	*Bombus* sp.	Phy	87	2.09
Apidae	*Eucera punctatissima*	Phy	3	0.07
Apidae	*Nomada cinnabarina*	Phy	1	0.02
Megachilidae	*Rhodanthidium siculum*	Phy	5	0.12
Crabronidae	*Larra anathema*	Pre	1	0.02
Chrysididae	*Chrysis cuprea*	Par	8	0.19
Chrysididae	*Chrysis ignita*	Par	3	0.07
Chrysididae	*Chrysis trimaculata*	Par	2	0.05

Table 1/1. Systematic list with inventoried insects, diet (D), numbers (ni) and frequency of abundance calculated for the study area (FA%). Pol: Polyphaga, Phy: Polyphaga, Pre: Predators, Par: Parasites, Sap: Saprophagous, Cop: Coprophagous.

Families	Species	D	Ni	FA(%)
Chrysididae	*Chrysis* sp.	Par	1	0.02
Formicidae	*Aphaenogaster* sp.	Pre	15	0.36
Formicidae	*Cataglyphis bicolor*	Pre	216	5.18
Formicidae	*Cataglyphis* sp.	Pre	46	1.10
Formicidae	*Crematogaster auberti*	Pre	56	1.34
Formicidae	*Crematogaster scutellaris*	Pre	9	0.22
Formicidae	*Crematogaster* sp.	Pre	1	0.02
Formicidae	*Messor barbarus*	Pre	148	3.55
Formicidae	*Tapinoma nigerrimum*	Pre	35	0.84
Halictidae	*Sphecodes fuxipennis*	Phy	1	0.02
Megachilidae	*Anthidium laterale*	Phy	1	0.02
Megachilidae	*Hoplitis anthocopoides*	Phy	2	0.05
Megachilidae	*Hoplitis* sp.	Phy	54	1.29
Megachilidae	*Osmia anceps*	Phy	2	0.05
Megachilidae	*Osmia pinguis*	Phy	6	0.14
Megachilidae	*Osmia* sp.	Phy	60	1.44
Megachilidae	*Osmia tricornis*	Phy	14	0.34
Megachilidae	*Osmia tridentata*	Phy	2	0.05
Pompilidae	*Anoplius* sp.	Phy	2	0.05
Sphecidae	*Ammophila sabulosa*	Pre	1	0.02
Vespidae	*Polistes gallicus*	Pre	1	0.02
Vespidae	Vespidae	Pre	2	0.05
Vespidae	*Vespula germanica*	Pre	1	0.02
Lepidoptera				
Lycaenidae	*Lycaena* sp.	Phy	29	0.70
Lycaenidae	*Lycaena* sp.	Phy	2	0.05
Lycaenidae	*Polyommatus icarus*	Phy	1	0.02
Nymphalidae	*Melanargia* sp.	Phy	1	0.02
Nymphalidae	*Vanessa cardui*	Phy	4	0.10
Papilionidae	*Papilio machaon*	Phy	1	0.02
Pieridae	*Colias croceus*	Phy	3	0.07
Pieridae	*Pieris brassicae*	Phy	1	0.02
Pieridae	*Pieris rapae*	Phy	1	0.02
Pieridae	*Pontia daplidice*	Phy	10	0.24
Orthoptera				
Acrididae	*Acrotylus patruelis*	Phy	1	0.02
Acrididae	*Aiolopus thalassinus*	Phy	9	0.22
Acrididae	*Calliptamus italicus*	Phy	1	0.02
Acrididae	*Sphingonotus* sp.	Phy	1	0.02
Gryllidae	*Gryllus campestris*	Phy	3	0.07
Gryllidae	*Gryllus* sp.	Phy	8	0.19
Gryllidae	*Oecanthus pellucens*	Phy	7	0.17
Mantidae	*Mantis religiosa*	Pre	1	0.02
Pamphagidae	*Ocneridia longicornis*	Phy	1	0.02
Pamphagidae	*Ocneridia* sp.	Phy	3	0.07
Pyrgomorphidae	*Pyrgomorpha cognata*	Phy	4	0.10

Table 1/2. Systematic list with inventoried insects, diet (D), numbers (ni) and frequency of abundance calculated for the study area (FA%). Pol: Polyphaga, Phy: Polyphaga, Pre: Predators, Par: Parasites, Sap: Saprophagous, Cop: Coprophagous.

Predatory species and polyphagous species are fairly well represented in study stations. Following Dajoz (2003), polyphagous species have a more eclectic diet. The polyphagous feed on animal and plant organic matter in different forms and they can therefore play a dual role. Predatory species can feed different prey during their life and their voracity is a useful indicator of their repressive potential; these characteristics affect the dynamics of predator-prey numerical interactions and the repressive effect expected from the study of predators (Hassell, 1978). A polyphagous predator uses several species of prey and the importance of each varies according to its relative availability (Coutier & Cloutier, 1992). Coprophages, saprophagous and parasites are poorly represented in our inventory despite their roles in the functioning of agrosystems. Coprophages contribute to soil formation through burrowing and the incorporation of organic matter (Bachelier, 1978) and they help to structure the soil with the recycling of dung in the soil supplying nitrogen in the soil (Dajoz, 1985).

The saprophagous use all the dead substances, in particular the decaying vegetable detritus, by the action of the microorganisms, the mushrooms, and then the insects which will constitute the humus (Villiers, 1979; Lamy, 1999).

According to Beaumont & Cassier (1983), there is no absolute trophic specialization in nature, so the distribution considers the type of diet of the adult states.

The Shannon index (H’) for the three categories of phytophagous, predators and polyphagous is high compared to the other categories (parasites, saprophagous and coprophages) for the Ouled Si Slimane station (Table 2).

This index gives an idea of the diversity of all population considering not only the number of species, but also the number of individuals from the different trophic populations. A community is even more diverse when the Shannon's diversity index (H’) is bigger. This index shows that the station Ouled Slimane is home to more diverse populations.

The equitability (E) of predators, polyphagous and phytophagous is high compared to parasites, coprophages and saprophagous (Table 2). This shows that the trophic categories in the study orchard are less balanced.

Coprophagous	Saprophagous	Parasites	Polyphagous	Predators	Phytophagous	
1	11	14	648	842	2654	**N**
1	5	4	13	31	71	**S**
0	0.02	0.03	0.42	0.47	0.41	**H'**
0	2.32	2	3.7	4.95	6.15	**H'max**
0	0.01	0.01	0.11	0.09	0.07	**E**

Table 2. Total richness (S), the Shannon index (H') and the equitability (E) of the insects identified by the diet.

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