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ORIGINAL ARTICLE

Study of soil acarofauna in the Djelfa area

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This research aims to study the terrestrial crickets in the Djelfa area in different environments by calculating the relative abundance of mites that were captured by the Berlèse device. According to the results and statistics, we knew their types and percentages in 2015, where we noticed in the apple orchards affiliated with ITMAS. We registered five types of moths; three of them exceeded the 25% threshold. *Trombidium sp.* 29.28%; *Rhyzoglyphus sp.* 26,31%; *Acaridae sp.* 25,74% As for the observed species in the forested area, we have counted nine species, but only two species had rates that exceeded 20%. *Trombidium sp.* 20,83 % *Rhyzoglyphus sp.* 41.67% In the end, we noticed the presence of 6 species of mites in the pastoral areas, two of which were at a relatively high rate, *Scutovertex sp.* 43,46 % and *Gamasida sp.* Ind 24.61% In light of these results, we were able to identify some moth species that inhabit different environments, and we will try in the future to know their biological characteristics and their relationship to this milieu.

Keywords: Djelfa, mites, apple orchard, ITMAS.

Introduction

Soil fauna participates in the decomposition of organic matter and the bioavailability of nutrients for plants and soil microorganisms. It also plays a role in creating and conserving the soil structure (Mayeux and Savanne, 1996). Soil fauna is an essential source of biodiversity that should be preserved, as these organisms play essential roles in maintaining soil quality (Chapman et al., 1997). Arthropods are the dominant element in the animal kingdom (Steiner et *al.*, 2005). Those who live in the soil contribute to the decomposition of organic matter (Petersonan and Luxton, 1982). Arthropods are invertebrates and group together several classes, crustaceans, myriapods, arachnids, and insects, without neglecting mites and arachnids (Roth, 1980). The distribution and activity of these arthropods are mainly determined by climatic factors such as temperature and humidity (Thiele, 1977). Arthropods represent a considerable percentage of living species, and no one can give the exact number of these arthropods (Corbara, 2004). In Algeria, little work has been done on soil acarofauna, among others we cite that of Niedbala (1985) on some new Oribates, of Ghezali (1997) on the richness of mites in a forest environment in the national park of Chréa and Fekkoun, and Ghezali (2007) on the acarofauna of citrus orchards in Boufarik. In this study, we studied the relative abundance of acarofauna in different natural environments in the Wilaya of Djelfa.

Presentation of study sites

This study was carried out in four regions; the region of Moudjebara extends over 20,000 ha with an altitude varying between 1,200 and 1,400 m. Its geographical coordinates respectively 3° 1713' to 3° 2540' east longitude and 34° 2840' to 34° 3912' north latitude. It is reforested by the Aleppo pine associated with natural plant formations (Alfa, Armoise, and Sparta). This station is mainly occupied by market gardening in open fields), in which we carried out our study. The second experimental perimeter is located at the level of the ITMAS Wilaya de Djelfa. The latter is planted by fruit trees, in which we have chosen an orchard of apple and olive trees. In the end, the region of Senalba chergui was chosen as a forest environment that extends over 19,833 ha at 1316 m a.s.l. This natural forest is occupied by the Aleppo pine associated with natural plant formations (alfa, sagebrush, and esparto) and a middle course. Its coordinates are 3°8 82 458 east longitude and 34° 2840 at 34 '37 61 787 north latitude.

Mites harvesting and observation technique

Here we presented the fieldwork technique in the laboratory and the necessary equipment, adding the advantages and disadvantages of the technique used to observe mites.

Taking soil samples

The sampling consists of taking six soil samples each month, from January 2015 until December 2015, with different depths 10 to 15 cm randomly using a pickaxe.

Extraction of mites from the soil with the Berlèse extractor

In this part, the description of Berlèse's device is presented first; then, we have developed the advantages and disadvantages of this technique.

Description of the Berlèse extractor

According to Benkhelil (1992), the Berlèse device is effective in capturing mites. The principle of this device is based on the negative phototaxis of mites (Vannier, 197O). According to Coineau et al. (1997), it is a dynamic or selective method that uses the tactism of individuals. The latter leave the sample by their average under the influence of the thermodynamic stimulus.
The soil samples are placed on sieves of 1 to 2 mm mesh which are deposited on funnels. These are fixed by support surmounted by a lamp facing the ground. Mites sensitive to the light source leak in depth, slide down the slopes of the funnel and are finally collected in containers containing water. The duration of this extraction is 3 to 4 days.

Relative abundance (R.A. %)

The abundance constitutes another essential parameter for the description of the structure of a stand (Ramade, 1989). The following equation can represent it:

R.A. %=(ni × 100)/N

R.A. %: Relative abundance of species *i* Present in the sample.

Ni: Number of individuals of species *i* Have taken into account.

N: Total number of individuals of all species together

In practice, here, R.A % is the relative abundance of each mite species present in each study station.

Results

Relative abundance of mite species captured by the Berlèse apparatus in apple cultivation

In Table 1, the percentages of mites captured by the Berlèse apparatus in apple tree cultivation have been presented in order of importance.

Species	ni	R.A.%
Trombidium sp.	207	29,28
Rhyzoglyphus sp.	186	26,31
Acaridae sp.	182	25,74
Scheloribates sp.	81	11,46
Gamasida sp.	51	7,21
Totals	707	100

R.A. Relative Abundance %. ni: Number of individuals.

Table 1. Relative abundance of mite species captured by the Berlèse apparatus in the apple tree crop.

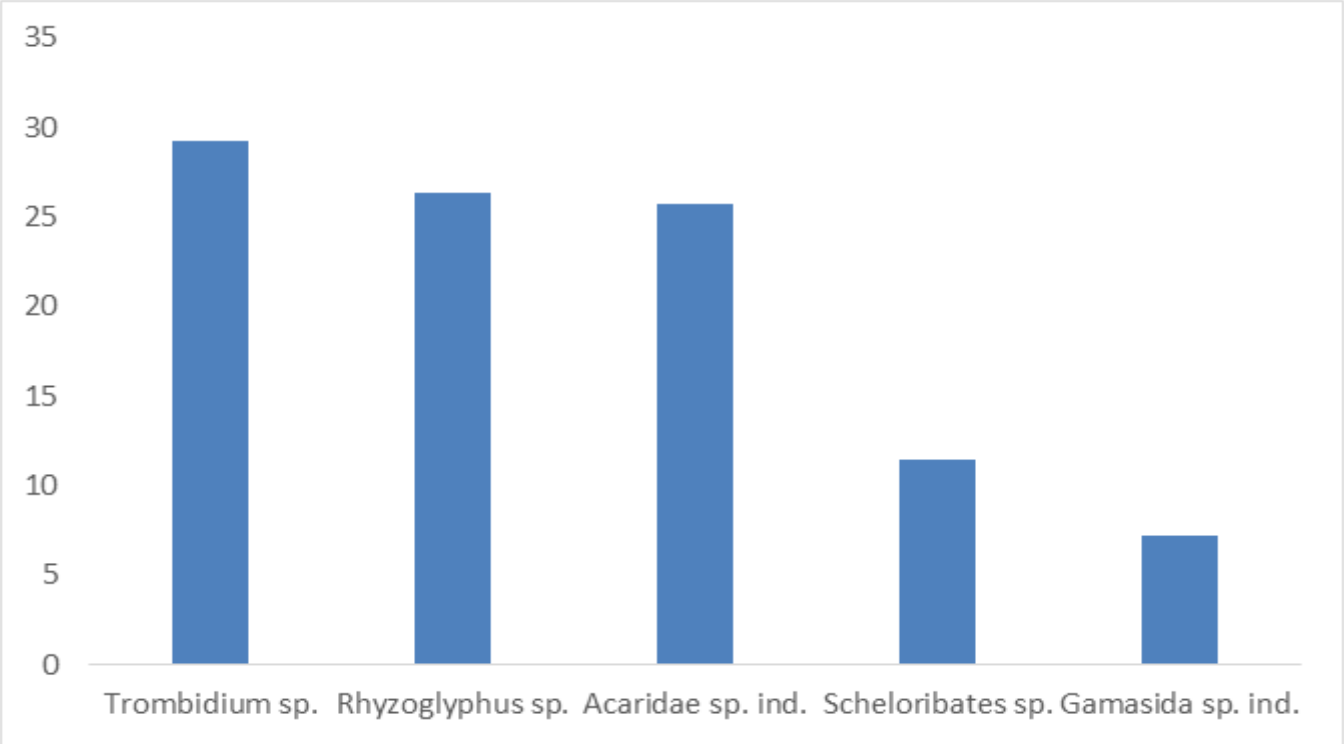

Fig. 1. Relative abundance of mite species captured by the Berlèse apparatus in the apple tree crop R.A. %: Relative abundance

Thanks to Berlèse's apparatus, 707 individuals were captured, which are divided into 5 species. The most abundant species is *Trombidium sp.* With 207 individuals (29.28%), they were followed by *Rhyzoglyphus sp.* with 186 individuals (26.31%). In third place, we find *Acaridae sp.* with 182 individuals (25.74%). It is followed by Schéloribates sp. with 11.46%. The last position is occupied by *Gamasida sp.* with (7%) (Table 1, Fig. 1).

Relative abundance of soil mite species captured by the Berlèse apparatus in a forest environment

The monthly percentages of mite species identified by the Berlèse apparatus in a forest environment are presented in Table 2.

Species	ni	R.A. %
Rhyzoglyphus sp.	90	41,67
Scheloribates sp.	4	1,85
Gamasida sp. ind	15	6,94
Hétérobelba sp.	6	2,78
Trombidium sp.	45	20,83
Oppius sp.	6	2,78
Scutovertex sp.	23	10,65
Galumna sp.	8	3,70
Haplacarus sp.	4	1,85
Arcoppia dechambrierorum	12	5,56
Scapheremaeus latus	3	1,39
Totals	216	100,00

R .A. Relative Abundance %. ni: Number of individuals.

Table 2. Relative abundance of mite species captured by the Berlèse apparatus in a forest environment.

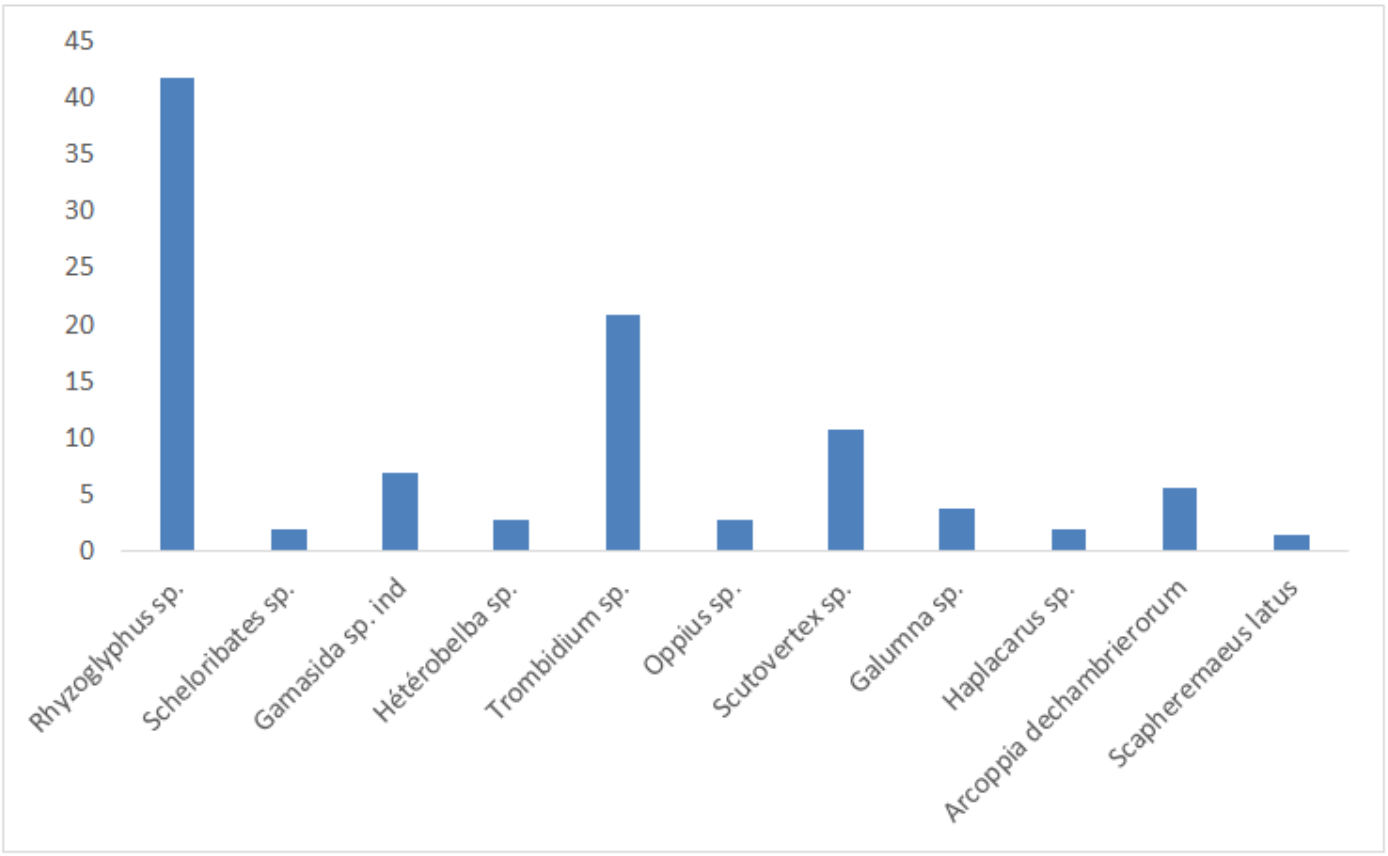

Fig. 2. Relative abundance of mite species captured by the Berlèse apparatus in a forest environment.

The use of Berlèse's apparatus made it possible to capture 216 individuals; these individuals are divided between 11 species. The most abundant species is *Rhyzoglyphus sp.* With 90 individuals (41.67%), they were followed by *Trombidium sp.* with 45 ind. (20.83%). In third place is *Scutovertex sp.* With 23 individuals (10.65%). It is followed by *Gamasida sp.* with 6.9%. The species that remain their abundances do not exceed (5.5%) (Table 2, Fig. 2).

Relative abundance of mites captured by the Berlèse apparatus in a pasture environment

The monthly percentages of mite species identified by the Berlèse apparatus in a pasture environment are presented in Table 3.

Species	ni	A.R. %
Scutovertex sp.	249	43,46
Gamasida sp. ind	141	24,61
Oppiussp.	39	6,81
Epilohmannia cylindrica	20	3,49
Rhyzoglyphus sp.	73	12,74
Sheloribates sp.	51	8,90
Totals	573	100

R .A. Relative Abundance %. ni: Number of individuals.

Table 3. Relative abundance of mite species captured by the Berlèse apparatus in a pasture environment.

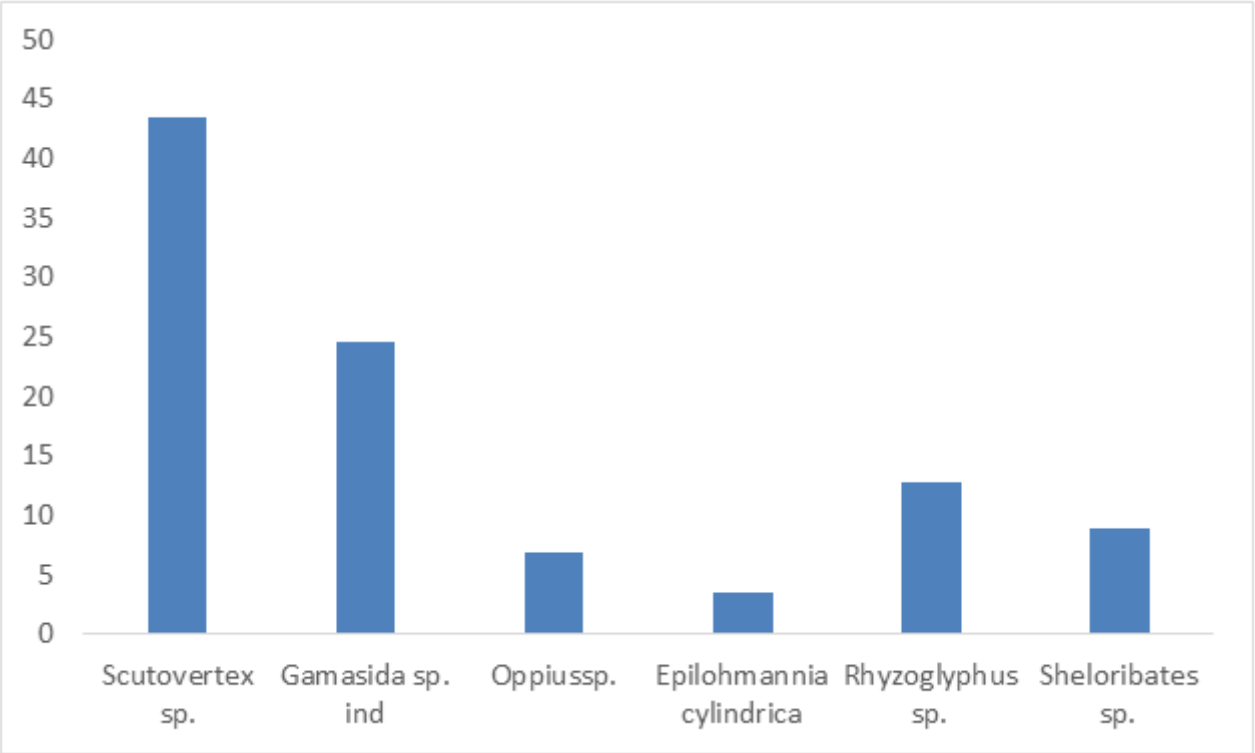

Fig. 3. Relative abundance of mite species captured by the Berlèse apparatus in a pasture environment.

The use of Berlèse's device allowed the capture of 573 individuals, which are divided into six species. The most abundant species is *Scutovertex sp.* With 249 individuals (43.46%), it is followed by *Gamasida sp.* with 141 individuals (24.61%). In third place is *Rhyzoglyphus sp.* With 73 individuals (12.74%), *Scheloribates sp.* occupies the fifth position with a frequency equal to 8.9% (Table 3, Fig. 3).

Discussion

Fekkoun et al. (2011) note that the order Oribatida is best represented by an undetermined species of Opiidae which has the highest frequency (A.R.%=47.5%) with 356 individuals in a cultivated environment in the Mitidja plain.
The inventory of mites recovered in the Berlèse apparatus carried out by Ghezali and Fekkoun (2012) made it possible to identify 2 orders of Gamasida and Oribatida in the two bioclimatic stages, arid and semi-arid, of which the most abundant species is *Scheloribates sp.* with 8 individuals (A.R. %=36.4%) in an arid bioclimatic stage and 18 individuals (A.R.%=27.3%) in a semi-arid bioclimatic stage. Kalakhi (2006) notes that the species of Gamasus sp. is most abundant in an olive orchard with 419 individuals (AR%=96.3%) and in the wheat field with 73 individuals (AR%=62.9%) Fekkoun and Ghezali (2007) note that Oppiidae sp. with 1326 individuals (A.R.%=43.0%) occupies the first place followed by *Scheloribates sp.* with 845 individuals (A.R.%=27.4%) in the Boufarik region.

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