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Soil Fauna Biodiversity in Apricot Orchard at Tkout (Batna–East of Algeria)

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Abstract – **Soil organisms contribute significantly to biodiversity and ecosystem functioning. In this context (It is in this light that) we found it useful to study soil fauna community in an orchard of apricot based in Tkout (Batna). This study was conducted from March 2012 to February 2013. Different sampling techniques were combined: TSBF, Barber pots, food traps and repellent traps. We have surveyed a total of 45 species thatare divided into6classes. Insects class is the most dominant with 36 species distributed among 25 families and 6 orders in which Coleopteran order is the most represented quantitatively.**

A great diversity of organisms belonging to the 6 main groups of soil invertebrates is represented (Insects, Myriapods, Arachnids, Crustaceans, Molluscs and Annelids). The herbivores are the most dominant food category in our inventory and the total wealth varies among months and seasons. It would be very useful to take realize this inventory over several years and supplemented by further studies on the bio-ecology of species that are very harmful and those of biological interest both on the ground and to this precious speculation which have a socio-economic interest as well as ecological one in T'kout area.

Keywords – **Apricot, Biodiversity, Soil Fauna, Tkout.**

I. Introduction

Fruit trees growing, including cores and pips fruit species has in recent years experienced a boom in the Algerian agriculture [1]. In the Aures region, this culture is the most species studied because of the importance it plays in local agriculture. Batna is ranked first in the production of apricot (50% of national production) [2].

Soil organisms contribute significantly to biodiversity and ecosystem functioning. Communities of soil fauna soil in T'kout (Batna) area remain very poorly described. For this purpose and in this context, we found it useful to characterize soil fauna communities in apricot orchard located in T'kout, in order to have knowledge about this community which have a very important ecological, biological and agronomic interests.

II. Materials and Methods

The present work providing a contribution to the study of the biodiversity of soil fauna, is conducted in an orchard of apricot in Tkout situated in the wilaya of Batna, during the period going from March 2012 to February 2013. We used Barbers pots to capture soil organisms, plastic pots (500ml) as food traps and two screens with two different mesh (1mm and 3mm) for the harvest of wildlife which is done manually after sharing the sample on 3 layers according to the depth of the soil. The sampling method is realized according to TSBF [3]; the targeted community of endogenous soil fauna (larvae or adults) is sampled by taking a soil sample 25 cm side to a depth of 30 cm and the wildlife harvest is done manually using two different mesh sieve and after sharing the soil sample in 3 layers depending on the depth (0-10cm, 10-20cm and 20-30 cm). Harvested animals are preserved in alcohol for identification. To collect wildlife flowing on the ground surface, 9 filled Barber pots containing 1/3 of water added to a detergent [4], are installed in the orchard studied, buried so that their opening is flush with the ground. The 9trapsare placed ona500m2homogeneous plot and aligned3-3 in 4 rows spaced with5m. Pots establishment is renewed randomly to cover the entire area of the orchard. Trapping is done weekly during the entire period of study from March 2012 to February 2013. Harvest soil organisms by food traps according to Kirfmann Métral method [5] is realized in our case during the spring, by the location of plastic pots 500 ml containing100g wheat grains humidified (Bait), up to 15 to 20 cm of the height of the trap, which are covered by a layer of 2cm of soil. Insects are attracted by the release of CO2 from wheat enter the food trap. Three food traps were positioned in a randomly on a transect of 25 m^2 and each time, trap locations are renewed to cover the entire area of the orchard. Concerning repellent traps, we used for our experiments formalin solution (concentration 0.25%) which is injected repeatedly into the ground. Worms and slugs flee a substance and back to the surface. This is done in a random plot of 1 m² and 10 liters of solution are paid 3 times.

III. Results and Discussion

1- Inventory

The results of soil fauna inventory sampled in our orchard studied according to 4 different sampling techniques, allowed the identification of a total of 45 species divided into six classes: Clitellata, Gastropoda, Arachnida, Diplopoda, Chilopoda, Crustacea, Insecta and Collembola. The class of the insects is the most dominant with 36 species divided into 25 families and 6 orders, including Coleoptera which is quantitatively better represented with 46.67% of all sampled species representing 21 species distributed between 13 families (Fig.1). Among insects, Coleoptera are considered the

most abundant and the most species-rich [6] since more than 400 000 species are described according to [7]. Also, it is important to note the diversity of their forms and ecological niches [8]) as well as ease of harvesting and conservation [9] In Algeria, our observations also coincide with those of [10], who studied the insect fauna of apple in the Aures region and reported a majority percentage of beetles representing 38 % of the total inventory.

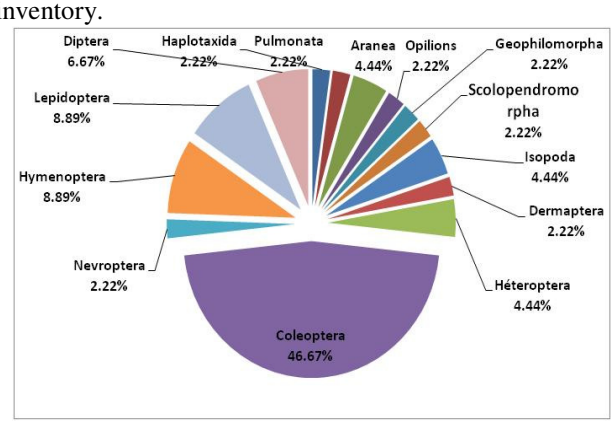

Fig.1. Importance of orders key levels of soil organisms enumerated in apricot orchards of Tkout

2- Temporal distribution of identified arthropods populations

We note that May is richer concerning a number of individuals (641) while March is the richest in number of species (38). January is quantitatively less represented with 57 individuals and December is less rich in terms of species number (14 species). We can explain this by climatic and environmental conditions favoring the good activity of soil organisms, namely temperature, soil moisture and vegetation during spring. Indeed, the increase in numbers of some species is dangerous for apricot which coincides with the fruiting period, namely bugs and moths, hence the need to intervene to protect the culture. In parallel, we note an increase of some Diptera, Coleoptera and spiders also that are reported in the literature as predators and parasites controlling outbreaks of these pests. According to [11] and [12], increasing plant diversity increases phytophagous diversity and consequently of their predators and parasites.

3- Functional diversity of arthropod population identified by the diet

Our study showed a dominance of Phytophagous (19 species) followed by predators (16species); the polyphagous and saprophagous are represented respectively by 5 and 4 species and only one species of parasitoids is noted (Table 1).

According to [13], there is no absolute trophic specialization in nature, and therefore the distribution takes into account the type of diet of adult's statements. In our case, predators come in first place in terms number of individuals (1372 individuals), while herbivores occupy the first place in species number (19 species representing approximately 42.00 %), this can be explained by the specific plant diversity in the studied orchard; according to [14], this diversity of plants can be by itself a major cause of diversity in some insects populations.

The Shannon index (H') for the two categories (predators, herbivores) is high compared to other categories (Saprophagous, parasitoids and polyphagous), which is confirmed by the fact that the number of species is important for first categories than for the latter. The Fairness (E) of predators, herbivores and Saprophagous is high; this means once again that the studied orchards populations arebalancedintheir biotope. The Saprophagous play an important role in the recycling of humus and degradation of organic matter providing nitrogen to the soil.

Table 1: Total Wealth(S), Shannon index (H '), maximum diversity (H'max) and Fairness index (E) of arthropods stands identified by diet

Diversity para-meters	Diet				
	Phyto-phagous	Predator	Poly-phagous	Sapro-phagous	Parasit oïde
N	649	1372	120	392	19
(S)	19	16	5	4	1
(H')	2.01	2.56	0.28	0.74	0.05
H'max	4.25	4.00	2.32	2.00	0.00
E	0.47	0.64	0.12	0.37	0.00

VI. Conclusion

Our study carried from March 2012 to February 2013 enabled us to contribute to the knowledge of soil fauna species in apricot orchard situated in T'kout area (Batna). A wide variety of organisms belonging to the 6 main groups of soil invertebrates is represented (Insects, Millipedes, Arachnids, Crustaceans, Annelids and Molluscs). Insect's class is the most dominant with 36 species distributed among 25 families and 6 orders with Coleopteran order as a most quantitatively represented. Phytophagous are the most dominant food category in our inventory. Total wealth varies among months and seasons. Spring seems to be the most favorable season for the maximum activity of identified species. However, even if our study is original in this area, but modest, suggests that the species richness of soil fauna may be influenced by temperature and soil moisture and the landscape context. To test this relationship, it would be very useful to take inventory over several years and in several apricot orchards where climate and landscape are different

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