

Malacological diversity on four Lamiaceae in the region of Tlemcen (Northwest of Algeria)

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Abstract

The region of Tlemcen is located in the north-west Algeria. Tends arid climate leads to a degradation of vegetation in open formation, where are found the doum the diss and broom.... Other aromatic species are considered: rosemary, thyme, lavender and horehound. By their morphological and botanical four aromatic species belonging to the Labiatae family. We propose an approach to achieve diversity malacofauna identified on these Lamiaceae. These latter are certainly a nutritional source for this malacological fauna. For this, an inventory is made in different stations. Malacological wealth of thyme is estimated at 19, that the rosemary to 18, on 14 and lavender to last, that the horehound 7. It includes four families namely Milacidae the Sphincterochilidae the Helicidae and Subulinidae. Milacidae are present only in horehound and lavender stations. On the other hand, the Sphincterochilidae, namely *Sphincterochila candidissima*, is absent on horehound and lavender. *Rumina decollata* is the only species in the family Subulinidae on four plants. Regarding the family Helicidae, specifically with the richest two subfamilies: those Helicinae and Helicellinae. The first subfamily consists of 11 species of thyme, 10 species of rosemary, 5 lavender and 4 species of horehound. The second subfamily comprises 7 in the lavender, 6 species respectively in the thyme and rosemary and 1 in the horehound. As we try to find the molluscan species specific to each of these plants and species that are common. Finally, the vertical distribution of gastropods is given.

Keywords: Malacological Fauna; Lamiaceae; Specific Richness; Vertical Distribution; Region of Tlemcen (Northwest of Algeria)

Introduction

In the region of Tlemcen, several studies have been conducted on terrestrial molluscs. Damerdji, Ladjmi and Doumandji (2005) conducted an inventory of malacofauna associated with rosemary [1]. Study wildlife associated with *Thymus ciliatus* malacological (Labiatae) was carried out by Damerdji (2010) [2]. A comparative study of the fauna present on these two herbs (thyme and rosemary) is made by Damerdji (2009b) [3]. Recently, Damerdji (2012a) conducted a study on wildlife malacological medicinal plants namely rosemary, thyme, horehound and cistus to sage leaves in the region of Tlemcen [4].

The composition and structure of the fauna malacological in station's *Lavandula dentata* were performed (Damerdji, In press) [5]. Also, in the same direction, the two malacofauna Cistaceae is *Cistus salvifolius* and *C. ladaniferus* was studied by Damerdji (2011) [6]. Also, this comparative study is the result of the work done on the diversity malacological 3 xerophytic plants namely *Chamaerops humilis*, *Ampelodesma mauritanicum* and *Calycotome spinosa* (Damerdji, 2005) [7]. We aimed to evaluate the molluscan species associated to Lamiaceae plants from Tlemcen, north-west of Algeria. The results relate to the diversity of the Malacological species on 4 Lamiaceae species specific and common and distribution by strata.

Methodology

Overview of the Region of Tlemcen

Tlemcen region is located in north-western Algeria. The climate tends to be dry which causes forest degradation in open formation, which is found xerophytic plants such as doum (*Chamaerops humilis*), diss (*Ampelodesma mauritanicum*) and broom (*Calycotome spinosa*). Other aromatic species are considered: rosemary (*Rosmarinus officinalis*) thyme (*Thymus ciliatus*), horehound (*Marrubium*

vulgare) and lavender (*Lavandula dentata*). Considered stations are chosen according to the recovery rate (over 30%) of plant species belonging to the family Lamiaceae in the region of Tlemcen.

The uneven distribution of rainfall on the one hand summer temperatures on the other hand characterize the Tlemcen region located in the semi-arid bioclimatic winter in temperate.

Study of different host plants

The four plants studied belong to the Phylum Spermaphytes and sub-Phylum Angiosperms, class of Eudicotes. Thyme, rosemary, horehound and lavender are part of the sub-class of Enasteridés I. The four species belong to the order Lamiales and family Lamiaceae.

The Labiatae, bringing together more than 3000 species in 200 genera about are not only distinguished by the structure of their irregular flowers with two lips but also by the essential oils they contain. The Labiatae are shrubs, sub-shrubs or herbaceous plants usually fragrant stem quadrangular. The leaves are usually opposite without stipules.

***Rosmarinus officinalis* L. (Rosemary):** Rosemary is a shrub that can be recognized from afar by its smell. This plant can reach 2 m high. The root is deep and swivel. The stem is crooked, angular and fragile. The leathery leaves are sessile opposite rigid glossy folded edges in greenish above, more or less hispid, whitish below. Blue flowers blossoming throughout the year attract many insects. The fruit is an oval berry, dry and smooth. Rosemary is found even in the wild. It can be grown. It is a plant with stimulant properties and qualities antiseptics and insecticides. It is used to make perfumes.

***Thymus ciliatus* Desf. (Thyme):** *Thymus ciliatus* is an aromatic plant that is growing wild in the guise of a highly branched subshrub at the base, very leafy, up to 40 cm. The root system is rotating and spread. The stem is highly branched. Thyme has many small floral leaves little dilated and opposite without stipules shortly petiolate. The flower is very large, with a red or purplish corolla bilabiate. The fruit is a smooth tetrakene. It is characteristic of limestone matorrals. Thyme has a strong smell, pleasant aromatic, bitter taste and warm. Thyme is widely used in herbal medicine. It is widely used in cooking for its pleasant aroma. It is also used by the perfume and pharmaceutical industries.

***Lavandula dentata* L. (Lavender):** Lavender is a chamaephyte in the form of dense clumps. This is an annual herb of a height of 40 to 80 cm, evergreen opposite, which may be whole or toothed. The bracts at the base of each cyme. The foliage is finely cut vegetation allowing more airy. Abundant flowering violet blue light is observed in spring season. Corolla monopetalous is reversed, tube longer than calyx limb and divided into five unequal lobes, rounded, imperfectly divided into two lips. *Lavandula dentata* is found in rock gardens, pastures and matorrals, on calcareous and siliceous soils superficial. Lavender used in herbalism, aromatherapy is considered a medicinal plant for the action of its oil used in perfumery.

***Marrubium vulgare* L. (Horehound):** Herbaceous perennial thyme-scented when crushed, covered with white down, with erect stems, often with many short shoots and sterile. Height of 40 to 60 cm. In general, fragrant plant stem quadrangular, with opposite leaves without stipules, flowers pentamers, usually hermaphrodite, axillary cymes together in more or less often contracted simulating whorls, or condensed at the top of the stems and simulating ears, lower lip forming a plane landing insects and thus to insect pollination. The Horehound prefers sunny places, growing on dry sandy fields and roadsides. This plant grows naturally in scrubland the djebels and wasteland. Since antiquity, horehound was already known for its therapeutic properties.

Equipments and samples of Molluscs

In the field: the methods used are 100 m² quadrats, traps and pots direct debits. Outputs on field ranged between 2010 and 2012. On the field, the samples are taken two times a month. The samples are returned to the laboratory where we separate living individuals' empty shells. These are placed in plastic bags; the small species are maintained in plastic tubes or glass.

In the laboratory: The live samples are placed in jars filled with water for 48 hours ie until complete death. They are then removed and placed in alcohol at 70° for their final conservation. First, we remove individuals we think interesting for dissection and of course to isolate the genitals required in the determination of gastropods. The shape, size, color and ornamentation of the shell are morphological differences that can help in the determination. The morphological description is based on the study of Mollusca Gastropoda Pulmonata biosystematics land in the region of Tlemcen [8].

Indeed, the determination was made by us from conchyliological characters.

Results and discussion

The results are based on the inventory of gastropods collected on four plants species specific and species common to the various plants.

Harvested molluscan species diversity on different plants

Based on our classification Germain (1969a and 1969b) a systematic list of species of gastropods found has been established. The results are given in the following table [9,10].

Total 25 species of gastropods are inventoried on four Lamiaceae. Helicidae family, the richest specifically includes 21 species. Ascending, thyme is the most populous in gastropods with 19 species followed by rosemary with 18 species. Malacological wealth is estimated at 14 to lavender and only 7 of the horehound (Table 1).

Emb.	Class	Order	sub-Order	Families	sub-Families	Genus – species	Thyme (19 species)	Rosemary (18 species)	Lavender (14 species)	Horehound (07 species)
				Milacidae		<i>Milax nigricans</i> <i>Milax gagates</i>	- -	- -	- +	+ -
MOLLUSCA	Gasteropoda	Pulmonata	Stylommatophora	Sphincterochilidae		<i>Sphincterochila candidissima</i>	+	+	-	-
				Helicidae	Helicinae	<i>Macularia hieroglyphicula</i>	+	+	+	+
						<i>Macularia jourdaniana</i>	+	+	-	+
						<i>Helix aspersa</i>	+	+	+	-
						<i>Archelix punctata</i>	+	+	-	-
						<i>Archelix lactea</i>	+	-	-	-
						<i>Archelix zapharina</i>	+	-	-	-
						<i>Archelix jullei</i>	+	+	-	+
						<i>Archelix wagneri</i>	+	+	-	-
						<i>Archelix polita punctatiana</i>	+	+	+	-
						<i>Eobania vermiculata</i>	+	+	+	-
						<i>Euparypha pisana</i>	+	+	+	+
						<i>Helix (Alabastrina) soluta</i>	-	+	-	-
						Helicinae	<i>Helicella (Cernuella) virgata</i>	+	+	+
<i>Helicella acompsia</i>	+	-	+	-						
<i>Helicella pyramidata</i>	+	+	+	-						
<i>Helicella reboudiana</i>	-	-	+	-						
<i>Helicella (Xeromagna) terveri</i>	+	+	+	-						
<i>Helicella (Xerovaga) globuloidea</i>	+	+	-	+						
<i>Helicella lauta</i>	+	+	-	-						
<i>Helicella breveti</i>	-	-	+	-						
<i>Cochlicella acuta</i>	-	+	+	-						
Subulinidae		<i>Rumina decollata</i>	+	+	+	+				

+ : Presence

Table 1: Species found on the Malacological four species of Lamiaceae

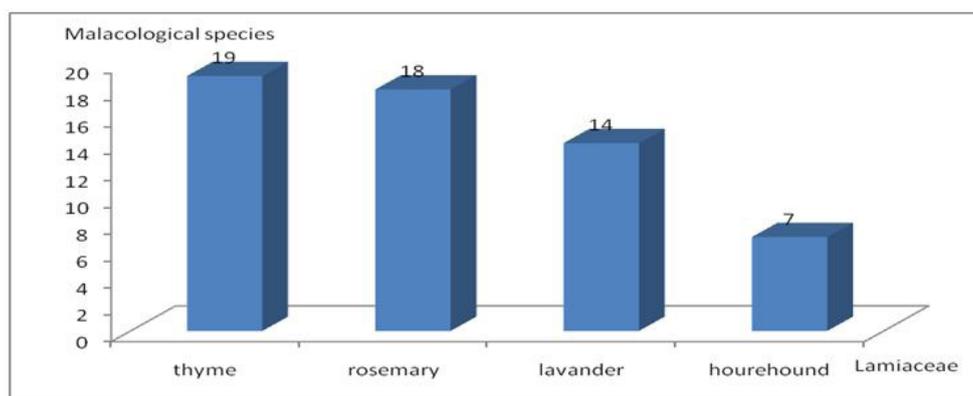


Figure 1: Diversity malacological of the four Labiatae

Distribution of different families malacological harvested 4 Labiatae

The results on the distribution of different families are given malacological in the following figure.

The family Milacidae is present on the lavender and horehound. It is represented by the species *Milax gagates* and *M. nigricans*. The family of three is shown Sphincterochilidae Lamiaceae namely rosemary and thyme. The family is the most important Helicidae specifically. It has 17 species of thyme rosemary 16 species 12 species of lavender and only 5 of the horehound. Subulinidae family

is represented by a single species on four plants with regard to *Rumina decollata*.

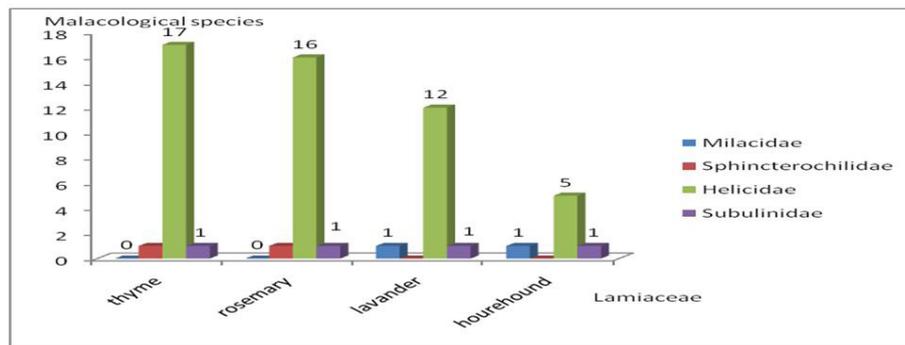


Figure 2: Importance of the different malacological families of the four Labiatae

Distribution of subfamilies Helicidae harvested four Labiatae

Given the importance of the family Helicidae, we separate into two subfamilies: This and that of the Helicinae Helicellinae. The results are shown in the following figure.

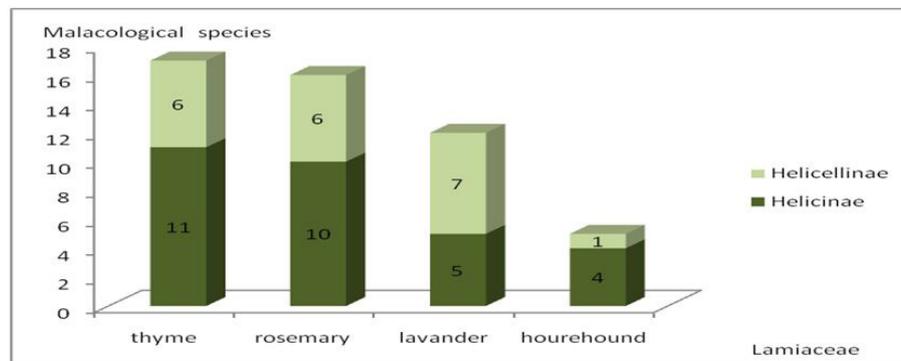


Figure 3: Importance of subfamilies Helicidae present on four species of Labiatae

Sub-Helicinae Family has 11 species of thyme, 10 of rosemary and 5 of lavender and only 4 of the horehound. Helicellinae account of the six species on the first 2 plants (thyme and rosemary) 7 species of lavender and only 1 on the horehound.

Specific to each species of Lamiaceae

Seven species are specific malacological. It is *Milax gagates* on lavender, *M. nigricans* on horehound, *Archelix lactea*, and *Archelix zapharina* on thyme, *Helix (Alabastrina) soluta* (Helicinae) on rosemary, *Helicella breveti* and *H. reboudiana* (Helicellinae) for lavender.

Cash malacological common to the various Lamiaceae

- Common species to four Lamiaceae

Three species are common to these four species Lamiaceae: *Macularia hieroglyphicula*, *Euparypha pisana* (Helicinae, Helicidae) and *Rumina decollata* (Subulinidae).

- Common species to three Lamiaceae

Nine species are common on three plants: *Macularia jourdania*, *Helix aspersa*, *Archelix juilleti*, *A.polita punctatiana*, *Eobania vermiculata* (Helicinae, Helicidae) *Helicella (Cernuella) virgata*; *H.pyramidata*, *H.terveri* and *H.globuloidea* (Helicellinae, Helicidae). *Macularia jourdaniana* (Helicinae, Helicidae) is common thyme rosemary and horehound.

- Species common to two Lamiaceae

Six species are common on two plants.

Sphincterochila candidissima (Sphincterochilidae), *Archelix punctata* and *A.wagneri* (Helicinae) and *Helicella lauta* (Helicellinae) are common on thyme and rosemary.

Helicella acompisa (Helicellinae) seems common thyme and lavender.

Finally, *Cochlicella acuta* is common rosemary and lavender.

Vertical distribution of gastropods on four Lamiaceae

The vertical distribution of different Lamiaceae is given in the following table.

Number of species	Different strata			
	Root	Surface of Soil	Stem	Leaves
Number of species of rosemary (18 species)	1	17	5	5
Number of species of thyme (19 species)	0	19	1	0
Number of species of lavender (14 species)	1	13	3	0
Number of species on the horehound (7 species)	0	5	2	0

Table 2: Distribution of species malacological according strata of four Lamiaceae

The majority of malacological species are found on the surface of soil in different station's Lamiaceae.

In the study of mollusk fauna of medicinal plants (Damerdji, 2012a) has identified 11 species, including 9 species to Helicidae of *Cistus* sage leaves. On *Marrubium vulgare*, (Damerdji, 2012a) indicates the presence of seven species malacology [4]. The diversity of the species of malacofauna Cistaceae 10 indicates the presence of species of *Cistus ladaniferus* malacological including 08 species Helicidae. Phenology *Cistus salvifolius* seems to favor the presence of *Helix aspersa* (Damerdji, 2011a) [6]. Still, in the region of Tlemcen and especially in the coast Ghazaouet (Damerdji, Sous presse) gave the composition is 14 species *Lavandula dentata* stations. 10 species are common on 5 plants *Chamaerops humilis*, *Ampelodesma mauritanicum*, *Calycotome spinosa*, *Rosmarinus officinalis* and *Thymus ciliatus* (Damerdji, 2009a) [11]. Seven malacological species are common on 7 plants (Damerdji, 2011) [5]. The family Sphincterochilidae is represented in 5 plants and 7 plants (Damerdji, 2009a and 2011b) [11,12]. The Subulinidae family is represented by a single species in five plants (Damerdji, 2009a) and seven plants studied (Damerdji, 2011) [5,11]. Damerdji (2005) shows the diversity malacological on 3 xerophytic plants: *Ampelodesma mauritanicum*, *Chamaerops humilis* and *Calycotome spinosa* [1,7]. The biotope of *Chamaerops humilis* L. is the typical biotope *Leucochroa candidissima*. This low scrubland, most often developed on limestone, arid mercilessly exposed to overgrazing, still characterizes much of the arid regions of the western Mediterranean (Sacchi, 1958) [13]. *Sphincterochila candidissima* particularly fond of limestone (Damerdji, 1990) [8]. By cons, *Euparypha pisana* is common throughout the Camargue where his tests are gathering under *Salicornia fruticosa* and home to many invertebrates (Aguesse and Bigot, 1962) [14]. According (Bigot, 1957) an important fauna representing the bulk orders of invertebrates and almost all orders of insects known Camargue, took refuge in the empty shells [15]. Gastropods make their epiphragmes order to survive extreme conditions (Damerdji and Djedid, 2008) [16]. Ecoethological spectacular phenomenon was found with hundreds of individuals belonging to a specific species of molluscs, *Euparypha pisana* form by grouping various plants on "meetings height" true "clusters" assembling between 0.30 m and 1 5m, from 15 to 1500 subjects (Bigot, 1967) [17]. Thorny species (Thistles, Opuntia) are often carriers of clusters. Thorns favor setting individuals on the plant. On *Ampelodesma mauritanicum*, 2 species Helicidae (*Euparypha pisana* and *Eobania vermiculata*) are considered phytophagous (Damerdji, 2002) [18]. According to (Khelil, 1989) [19] the individuals are consumers *Leucochroa candidissima* foliage of *Stipa tenacissima*. Herbs are certainly a source of nutrition for wildlife malacological (Damerdji, 2012a) [4,19]. Insects and including Orthoptera use as a food source and for the pollination of Lamiaceae (Damerdji, 2012b) [20].

Conclusion

The study conducted in malacological different stations allows us to say: thyme is the richest with 19 species specifically and horehound with only 7 species. Family Helicidae remains the largest and the most diversified in various Lamiaceae. We find 3 species common to these four plants including 2 species of Helicidae and *Rumina decollata* (Subulinidae). We meet *Milax nigricans* and *M. gagates* (Milacidae) respectively on *Lavandula dentata* and *Marrubium vulgare*. We note six common species between the thyme rosemary and lavender.

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