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A CONTRIBUTION TO DATA ON MITE FAUNA IN THE AZORES ISLANDS

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ABSTRACT

During a survey in June-July 1993 in the Faial, Pico and San Miguel islands belonging to the Azores archipelago, 22 mite species were collected from different cultivated plants, shrubs and weeds. The most important group on the plants were phytoseiid mites with 13 species; tenuipalpid and tetranychid mites were the commonest among the phytophagous species. *Amblyseius herbicolus* (Chant) was the dominant mite species in the three islands and on both cultivated and spontaneous vegetation. Observations were made on geographical distribution, host plant relationships and mite presence on introduced and native plant species.

INTRODUCTION

The last 30 years has seen an outstanding increase in knowledge concerning Mite species living on plants in Portugal, thanks mainly to the work carried out by CARMONA (1960; 1962; 1964; 1966; 1970; 1973; 1981 y 1992) and CARMONA and DIAS (1980), whose studies focus mainly on the species present in cultivated plants. However, little is known about the Mite fauna inhabiting the Azore islands, where few studies have been carried out: one by CARMONA (1981) and others by local researchers (CARNEIRO, 1982; SOARES *et al.*, 1992; SCHANDERL *et al.*, 1993 and SOARES *et al.*, 1993).

In order to obtain more detailled information about Mite species which live on cultivated, endemic and spontaneous vegetation on the islands, the "Entomological Predator" section of the Biology Department, Azores Islands University, has carried out a project to study the Mite fauna belonging to Tetranychid and Phytoseiid mite species inhabiting the islands. A scientific expedition took place in June-July 1993 on the island of Faial, where crops that are most representative of the area were prospected, namely citrus, endemic and spontaneous vegetation. This study was later extended to the islands of San Miguel and Pico.

The results obtained have greatly increased the number of known species on the islands, citing 22 species belonging to 5 different families, among which 13 are phytoseiid mite species, predatory mites which are of great interest in the study of biological control of mites and phytophagous insects which cause a great deal of damage to crops.

METHODS

Samples were collected between the 27th June and the 6th of July, Faial was visited between 27 June and 02 July 1993, Pico on the 01.July and San Miguel on the 05 and 06 July 1993. The majority of the mites were taken directly from the leaves using a fine brush, and then conserved in alcohol 70°. At the same time, some of the samples were taken and placed in a Berlese funnel in order to collect the mites they contained. All the specimens conserved in alcohol were taken to Valencia, where they were classified. The samples were collected by three of the researchers, J. Costa-Comelles, R. Vercher and A.O. Soares, while F. Ferragut identified and classified them.

A total of 42 samples were collected, of which 36 proved to contain mites. Of these, 36 samples corresponded to citrus, 9 to other fruit trees and cultivated crops, 5 to spontaneous vegetation growing near the cultivated areas, and 4 to plant species found only on the island of Macaronesia.

The following results show the location, dates and specimens with respect to each species. All the material studied is to be found in the Collection of the Agricultural Entomological Teaching Unit, of Valencia Polytechnic University.

RESULTS

The results obtained are summarized in Table 1, where the relationship is studied between the species found, the host plant and the island where they were collected. Four hundred specimens were examined, and grouped into 22 different species belonging to 5 families, of which Phytoseiidae make up the majority with 13 species. Among the phytophagous mites, Tetranychidae and Tenuipalpidae are outstanding with 3 and 4 species, respectively. Tydeidae (saprophagous) and Cheyletidae (predatory), are represented by only one species.

Phytoseiidae Berlese

Amblyseius californicus (McGregor)

SÃO MIGUEL, Rabo de Peixe, 06.July.1993, 1m, on orange.

A species with cosmopolitan distribution, living in mediterranean-type climates. Frequently on cultivated plants in the warm coastal areas of the Iberic Peninsula, where it is found associated with mites belonging to the genus *Tetranychus*, on which it feeds.

TABLE 1. Mites found on the different plant species in the Azores.

	SPECIES	PLANT	ISLAND
PHYTOSEIIDAE	*Amblyseius herbicolus*	Medal,Orange,Hydranger,Erica scoparia,Lemon,Myrica faya, Avocado,Plum,Apple,Fig Vine.	FAIAL/PICO SAN MIGUEL
	Iphiseius degenerans	Orange	FAIAL S.MIGUEL
	Euseius stipulatus	Orange	FAIAL S.MIGUEL
	Phytoseiulus macropilis	Leonotis leonorus, Hydranger, Celidonea sp.	FAIAL
	Typhlodromus sp. (gr.pyri)	Erica scoparia, Myrica faya	FAIAL
	Amblyseius umbraticus	Mint	FAIAL
	Amblyseius graminis	Mint	FAIAL
	Amblyseius sp. (gr.obtusus)	Orange	SAN MIGUEL
	Amblyseius californicus	Orange	SAN MIGUEL
	Amblyseius eudentatus (?)	Orange	PICO
	Typhlodromus phialatus	Orange	SAN MIGUEL
	Typhlodromus sp. (gr.rhenanus)	Orange	PICO
	Phytoseius sp.	Leonitis leonorus	FAIAL
TENUIPALPIDAE	*Brevipalpus phoenicis*	Medal,Orange,Mint,Hydranger	FAIAL/PICO SAN MIGUEL
	Brevipalpus sp.	Myrica faya	FAIAL
	Tenuipalpus sp.	Erica scoparia	FAIAL
TETRANYCHIDAE	*Tetranychus ludeni*	Orange,Mallow,Fig,Yam, Leonotis leonorus	FAIAL/PICO SAN MIGUEL
	Tetranychus urticae	Naranjo,Celidonea sp.	FAIAL
	Panonychus citri	Orange	FAIAL
	Panonychus ulmi	Apple	PICO
TYDEIDAE	*Orthotydeus* sp.	Myrica faya, Lemon,Avocado	FAIAL/PICO
CHEYLETIDAE	*Dendrocheyla wellsi*	Medal,Hydranger	FAIAL

Amblyseius eudentatus (?) (Karg)

PICO, Experimental plot, 01.July.1993, 1 h., on orange.

The sample was in bad condition and could not be determined accurately. This is a rare species which has only been found on two occasions.

Amblyseius graminis Chant

FAIAL, Feteira, 30.June.93, 3 h., on mint.

Species distributed throughout Europe, it is found in pulses and low-lying plants and shrubs on the Iberian Peninsula

Amblyseius herbicolus (Chant)

FAIAL, Almoxarife, 29.June.93, 12 h., on medlar; Almoxarife, 29.June.93, 5 h., on hydranger; Almoxarife, 27-VI-93, 5 h., on orange; Feteira, 29-VI-93, 5 h. 1 m., on orange; Monte da Guia, 30-VI-93, 1 h. on *Erica scoparia*; Castelo Branco, 30-VI-93, 6 h., on orange; Ribeira do Cabo, 30-VI-93, 14 h., on lemon tree; Canto, 30-VI-93, 3 h., on *Myrica faya*; PICO, Experimental plot, 1-VII-93, 5 h., on orange; Experimental plot, 1-VII-93, 1 h., on avocado; Experimental plot, 1-VII-93, 2 h., on plum; Experimental plot, 1-VII-93, 1 h., on apple; Experimental plot, 1-VII-93, 1 h., on fig; S. Amaro, 1-VII-93, 2 h., on vine; Piedade, 1-VII-93, 4 h., on orange; Riberinha, 1-VII-93, 3 h., on orange; SÃO MIGUEL, Sete Cidades, 5-VII-93, 5 h., on orange; Ginetes, 5-VII-93, 29 h. 3 m. 10 inm., on orange; Ribera Chã, 6-VII-93, 5 h., on orange; Furnas, 6-VII-93, 10 h. 4 inm., on orange; Rabo de Peixe, 6-VII-93, 1 h. 3 inm., on orange.

Species with cosmopolitan distribution which lives in zones with a tropical or subtropical climate world-wide.

Amblyseius umbraticus (Chant)

FAIAL, Feteira, 30-VI-93, 3 h. 1 m., on mint.

Phytoseiid distributed throughout the holarctic region. Seldom found on the Iberian Peninsula.

Amblyseius sp. (obtusus group)

SÃO MIGUEL, Sete Cidades, 5-VII-93, 1 h., on orange.

Euseius stipulatus (Athias-Henriot)

FAIAL, Ribeira do Cabo, 30-VI-93, 1 h., on orange; SÃO MIGUEL, Sete Cidades, 5-VII-93, 1 h., on orange; Ribera Chã, 6-VII-93, 11 h. 3 m. 3 inm., on orange; Furnas, 6-VII-93, 3h. 3 inm., on orange.

A species typical of the Mediterranean basin and the Macaronesia, it inhabits different shrubs and woody plants. It is the most dominant phytoseiid mite found in citrus, where it is considered to be an efficient predator of the citrus red mite *Panonychus citri*.

Iphiseius degenerans (Berlese)

FAIAL, Feteira, 29-VI-93, 13 h. 5 m., on orange; Almoxarife, 27-VI-93, 4 h., on orange; Castelo Branco, 30-VI-93, 2 m., on orange; SÃO MIGUEL, Furnas, 6-VII-93, 4 h., on orange; Rabo de Peixe, 6-VII-93, 1 h., on orange.

Phytoseiid belonging to tropical and subtropical climates, recorded by CARMONA (1962) on Madeira island on *Prunus*. It is also frequently found on the Canary islands (FERRAGUT, obs. pers.), however, it has only been recorded once on the Iberian peninsula.

Typhlodromus phialatus Athias-Henriot

SÃO MIGUEL, Rabo de Peixe, 6-VII-93, 2 m., on orange.

Mediterranean species common in the north of Africa, presente on the Iberian peninsula where it lives on a number of cultivated plants, such as citrus and vine, as well as on spontaneous vegetation.

Typhlodromus rhenanus (?) (Oudemans)

PICO, Experimantal plot, 1-VII-93, 1 h., on apple.

The sample was in bad condition and could not be determined with precision. This species was recorded in Madeira by CARMONA (1973).

Typhlodromus sp. (grupo pyri)

FAIAL, Monte da Guia, 30-VI-93, 4 h. 1 m., on *Erica scoparia*; Canto, 30-VI-93, 1 h. 1m., on *Myrica faya*; Canto, 30-VI-93, 1 h., on *Erica scoparia*.

Phytoseiulus macropilis (Banks)

FAIAL, Castelo Branco, 30-VI-93; 1 h. 1m., on *Celidonea* sp.; Canto, 30-VI-93, 1 h., on hydranger; Horta, 2-VII-93, 2 h., on *Leonotis leonorus*.

A species with subtropical distribution associated with mites belonging to the genus *Tetranychus* on which it feeds. It has been recorded in continental Portugal by CARMONA (1966) on different host plants. It also inhabits the Canary islands, but has not been found on the Spanish peninsula (FERRAGUT, obs. pers.).

Phytoseius sp. (plumifer group)

FAIAL, Horta, 2-VII-93, 7 h., on *Leonotis leonorus*.

Tenuipalpidae Berlese

Brevipalpus phoenicis (Geijskes)

FAIAL, Almoxarife, 29-VI-93, 4 h., on medal; Feteira, 29-VI-93, 6 h. on orange; Almoxarife, 27-VI-93, 3 h. 2 n., on orange; Feteira, 30-VI-93, 1 h., on mint; Almoxarife, 29-VI-93, 2 h., on hydranger; Almoxarife, 27-VI-93, 2 h., on orange; PICO, Experimental plot, 1-VII-93, 3 h. 1 m., on orange; Riberinha, 1-VII-93, 9 h., on orange; SÃO MIGUEL, Sete Cidades, 5-VII-93, 13 h. 2 n., on orange; Furnas, 6-VII-93, 6 h. on orange.

A mite with cosmopolitan distribution, polyphagous, found in abundance on citrus, where it produces considerable damage in some areas. Widely spread thoughout the Macaronesian islands, it has been recorded in the Azores before, by CARMONA (1981), SCHANDERL *et al*, (1993) and SOARES *et al.* (1993) on *Citrus sinensis* and in Madeira by the first author (CARMONA, 1973).

Brevipalpus sp.

FAIAL, Canto, 30-VI-93, 1 h. 1 n., on *Myrica faya.*

Tenuipalpus sp.

FAIAL, Canto, 30-VI-93, 1 h., on *Erica scoparia*.

Tetranychidae Donnadieu

Tetranychus ludeni Zacher

FAIAL, Almoxarife, 27-VI-93, 6 h. 2 m., on orange; Castelo Branco, 30-VI-93; 1 h. 1 m., on yam; Horta, 2-VII-93, 12 h. 2 m., on *Leonotis leonorus*; PICO, Experimantal plot, 1-VII-93, 1 m., on fig; S. Amaro, 1-VII-93, 3 h., on mallow; SAN MIGUEL, Sete Cidades, 5-VII-93, 9 h. 1 m., on orange.

Its distribution encompasses tropical and subtropical regions and some areas in the temperate zone. It can be found on a great variety of plant species and has been recorded on continental Portugal (CARMONA & DIAS, 1980), on Azores (CARNEIRO, 1982 and SCHANDERL *et al.*, 1993), Madeira (CARMONA, 1992) and on the Canary islands (FERRAGUT & SANTONJA, 1989; PANDE *et al.*, 1989).

Tetranychus urticae Koch

FAIAL, Almoxarife, 27-VI-93, 5 h. 3 m., on orange; Almoxarife, 27-VI-93, 1 h. 2 m., on orange; Castelo Branco, 30-VI-93, 1 h. 1 m., sobre *Celidonea* sp.

Cosmopolitan species, greatly polyfagous, widely distributed on the Iberian peninsula and the Macaronesian islands. It has recently observed on Azores islands (SCHANDEL *et al*, 1993)

Panonychus citri (McGregor)

FAIAL, Feteira, 29-VI-93, 2 h. 2 m., on orange; Almoxarife, 27-VI-93, 6 h. 2 m.; SAN MIGUEL, Furnes, 6-VII-93, 6 h. 6 m., on orange.

This mite is associated with citrus and can be found in every region where these are cultivated. It has recently entered and spread widely throughout Spain (GARCIA-MARI y DEL RIVERO, 1981), continental Portugal (CORREIA, 1985), Canaries

(FERRAGUT *et al.*, 1988) and the Azores (SCHANDERL *et al.*, 1993 and SOARES *et al.*, 1993).

Panonychus ulmi Koch

PICO, Experimental plot, 1-VII-93, 3 h. 2 m., on apple.

This species is distributed throughout the holarctic region on Rosacea, also causing economic losses in diverse fruit trees and vine in a number of European countries. It has been recorded with great frequency on the Iberian peninsula; it has also been found on Madeira (CARMONA, 1973) and Canaries (PANDE *et al.*,1989).

Tydeidae Kramer

Orthotydeus spp.

FAIAL, Monte da Guia, 30-VI-93, 6 inm., on *Myrica faya*; Ribeira do Cabo, 30-VI-93, 2 h. 3 inm., on lemon; Canto, 30-VI-93, 2 h., on *Myrica faya*; PICO, Experimental plot, 1-VII-93, 2 inm., on avocado; Experimental plot, 1-VII-93, 4 h., on lemon.

At least two species belonging to this genus have been collected which we have not been able to determine.

Cheyletidae Leach

Dendrocheyla wellsi (Baker)

FAIAL, Almoxarife, 29-VI-93, 1 h., on medal; Almoxarife, 29-VI-93, 1 inm., on hydranger.

Species known in the Azores and North and Central America, found on fruit trees, under the cover of some scale insects on which they feed.

DISCUSSION

The results obtained show that, with respect to the species found, no outstanding differences exist between the three islands belonging to archipelago where sampling was carried out. Moreover the few differences found are owed more to the differences in the plants examined on each island.

The group which proved to be richest in species is that of Phytoseiidae, which accounts for 13 of the 22 species collected. The mite found most frequently and in greatest abundance was *Amblyseius herbicolus*, appearing on all three islands, on both cultivated and spontaneous plants, and in 22 of the 36 samples in which mites were found, giving, at times, high populational levels. Among the other phytoseiid species *Iphiseius degenerans* and *Euseius stipulatus* stand out. These species appear in 14% of the samples, however, while *A. herbicolus* was found on any plant type examined *I. degenerans* and *E. stipulatus* were found exclusively on citrus. The remaining phytoseiidae were found in lower proportion.

With regard to Phytophagous mites, the most widely-spread species is *Brevipalpus phoenicis* which was found in 10 of the 36 samples, on both cultivated plants and spontaneous vegetation. In 7 of these 10 samples this species is associates with *A. herbicolus*. This fact, together with the observation that the phytoseiids are tainted red, suggests that *B. phoenicis* constitutes one of its habitual prey.

Among the tetranychid mites the presence of *Panonychus citri* was notable in a number of the orange groves visited, and also *Tetranychus ludeni* and *T. urticae* in numerous samples, in some which they were found together on the same plant.

On comparing the presence of species between different plants, important differences were recorded. The most outstanding is that in some species a certain preference seems to exist with respect to plant type. Thus, the most widely distributed mites, generally associated with crops, are also found on cultivated plants here, but not on the indigenous vegetation. This is the case of *I. degenerans, E. stipulatus, Amblyseius californicus* and *Typhlodromus phialatus* among the phytoseiidae, and *T. ludeni*, *T. urticae* and *B. phoenicis* among the phytophagous. These species predominate in crops and vegetation found near cultivated areas, but would appear to have difficulties in colonizing the flora indigenous to these islands. Curiously, the mite species most rarely found in this study, such as *Typhlodromus* sp. (pyri group), *Brevipalpus* sp. and *Tenuipalpus* sp., were found on *Myrica faya* and *Erica scoparia*, what is more, some of them could constitute species which have been scientifically unknown before now. These mites have not been collected from any other plant type.

This study has greatly widened the recorded knowledge of mite species inhabiting the Azores islands, increasing the number of cited species; it would, however, be of great interest to continue sample collection on the other islands which make up this archipelago, specially from indigenous flora, where it would appear that original species of fauna can be found, which are more representitive of the islands.

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