PHYTOSEIID MITES (ACARI: MESOSTIGMATA) OF SOUTHERN TUNISIA

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TUNISIA
PHYTOSEIIDAE
DATE PALM
OASES

SUMMARY: Authors report the results of a survey of phytoseiid mites carried out in 2000 and 2001 in some perennial crops and the surrounding wild vegetation, mainly in date palm production areas. Twelve species were found, among which 4 are new for Tunisia and one genus and one species are new to Science.

TUNISIE
PHYTOSEIIDAE
PALMIER DATTIER
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RÉSUMÉ : Les auteurs présentent les résultats de collectes de Phytoseiidae réalisées en 2000 et 2001 dans des cultures pérennes et sur la végétation spontanée environnante, principalement dans les palmeraies du Sud de la Tunisie. Douze espèces ont été recensées, parmi lesquelles 4 sont nouvelles pour la faune de Tunisie et un genre et une espèce sont nouveaux pour la Science.

INTRODUCTION

A single species of phytoseiid mites, *Phytoseiulus persimilis* Athias-Henriot, has been identified from the Gafsa region by RAMBIER (1972). More recently, we reported the results of the surveys carried out throughout 7 years in five regions of the Northern Tunisia (North, Center, Cap-Bon, Bizerte and Sahel regions), in the four main crops (KREITER *et al.*, 2002): vegetable productions in greenhouses, apple and citrus orchards, and grapevines. Thirty-seven species belonging to 8 families in total were found, and among them 30 species were not previously reported from Tunisia. In addition, we report here the results of surveys carried out in 2000 and 2001 in the southern part of Tunisia, mainly in several date palm production areas.

MATERIAL AND METHODS

Plant inhabiting mites were sampled from various cultivated or uncultivated plants in 2000 and 2001 by collecting directly on leaves of host-plants with a brush using a stereoscopic microscope, by using the dipping-checking-washing method (BOLLER, 1984), mites being collected on a filter at the end of the process, or by beating shrubs and trees. Mites were then transferred with a fine hairbrush into small plastic vials containing 70° alcohol. Mites were mounted on slides using Hoyer's medium and identified using a phase and interferential contrasts microscope.

The generic classification of CHANT & MCMURTRY (1994) is used for the Typhlodrominae and Phytoseiinae, the generic classification of CHANT & MCMURTRY (2003a & b) for Amblyseiinae Neoseiu-

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lini and Kampimodromini and of MORAES *et al.* (2004) for other Amblyseiinae.

The chaetotaxy and adenotaxy terminologies used in this paper were proposed respectively by ROWELL *et al.* (1978) for dorsal and CHANT & YOSHIDA-SHAUL (1991) for ventral idiosomal setae. Adenotaxy and poroidotaxy terminologies are that of ATHIAS-HENRIOT (1975).

All average measurements done are given in micrometers (μm).

Specimens of each species are deposited in the mite collections of ENSA.M / INRA Acarology laboratory.

The following abbreviations are used in this paper: INRA (Institut National de la Recherche Agronomique; Centre de recherche de Montpellier, France), ENSA.M (Ecole Nationale Supérieure Agronomique de Montpellier, France), INAT (Institut National Agronomique de Tunisie).

RESULTS AND DISCUSSION

Twelve species were found, with a new genus and a new species for Science and 11 already known species, 4 being new for Tunisia.

Amblyseiinae

***Euseius scutalis* (Athias-Henriot)**

Typhlodromus scutalis Athias-Henriot, 1958a: 183 ;
Amblyseius scutalis Athias-Henriot, 1960: 297;
Amblyseius rubini Swirski & Amitai, 1965: 132;
Amblyseius delhiensis Narayanan & Kaur, 1960: 5;
Amblyseius gossipi El-Badry, 1967: 177.

This species seems very common all around the Mediterranean Sea. It was described from Algeria (ATHIAS-HENRIOT, 1958a) and mentioned in Turkey (COBANOĞLU, 1989), and Spain on *Citrus* sp. (FERRAGUT *et al.*, 1983; GARCIA MARI *et al.*, 1985 and 1986). This species seems also very common in the driest regions of the northern Tunisia (KREITER *et al.,* 2002) and of the South of Spain (FERRAGUT & ESCUDERO, 1997). Several studies have been carried out to determine the influence of several climatic conditions on the development of this mite and have shown that it can resist to high temperatures (optimal development at 30° C) and to dry conditions (BOUNFOUR & MCMURTRY, 1987; EL-LAITHY & FOULY, 1992). This could explain why this species is preferably found in arid and hot regions. It has neither been found in the South of France and the South of Spain seems to constitute the northern limit of its distribution. Even it seems that it shows the same food preference (pollen and spider mites, genus *Tetranychus*) like *Euseius stipulatus* (Athias-Henriot), these two species do not have the same ecological requirements. In humid regions, *E. stipulatus* is more frequent than *E. scutalis*, more often found in dry places (FERRAGUT & ESCUDERO, 1997). This species is also reported as a predator of *Bemisia tabaci* (Gennadius) (MEYERDIRK & COUDRIET, 1986).

PREVIOUS RECORDS: Algeria, Canaria Islands, Cape Verde, Egypt, Ghana, India, Iran, Israel, Jordan, Turkey, Lebanon, Morocco, Spain, Pakistan (MORAES *et al.*, 2004), North of Tunisia (KREITER *et al.*, 2002).

SPECIMENS EXAMINED: Tozeur, 7 ♀ + 1 M3] on *Hibiscus* sp. and 17 ♀ + 2 ♂ on *Musa paradisiaca*, 11 ♀ + 1 ♂ on *Ricinus communis*, 21 ♀ + 1 ♂ on *Malus pumila*, 1 ♀ on *Vitis vinifera*, IV 2000; Tozeur, Jardin du Paradis, 8 ♀ on *Hibiscus arboreus*, IV 2000; Douz, Hôtel Sahara, 1 ♀ + 1 ♂ on *Hibiscus* sp., 1 ♀ on an unknown Verbenaceae, IV 2000, and 3 ♀ on *Lantana camara*, IV 2001; Oasis de Douz, 2 ♀ + 2 ♂ on *Ricinus communis*, IV 2000; Tataouine, Hôtel Dak Yanus, 12 ♀ + 1 ♂ on *Althea rosea*, IV 2000; Palmeraie Ibn Chabbat, 1 ♀ on *Cynodon dactylon*, VII 2000; Palmeraie de Tozeur, 6 ♀ on *Prunus persica*, 9 ♀ + 3 ♂ on *Vitis vinifera*, 7 ♀ + 9 ♂ on *Punica granatum*, 8 ♀ on *Morus* sp., 1 ♀ + 1 ♂ on *Ficus carica*, 1 ♀ + 1 ♂ on *Cynodon dactylon*, 1 ♂ on an unknown Asteraceae, VII 2000; Nefta, 5 ♀ + 1 ♂ on *Phoenix dactylifera,* IV 2000.

***Iphiseius degenerans* (Berlese)**

Seius degenerans Berlese, 1889: 9;
Iphisieus generans, Berlese, 1921: 95; Evans, 1954: 518.

Described in Italy during the 19^{e} century (BERLESE, 1889), this species has a wide distribution. It was found in Israel on *Citrus* sp. (PORATH & SWIRSKI, 1965), in *Citrus* sp. and olive trees in Greece (PAPAIOANNOU-SOULIOTIS *et al.*, 1994) and on grapes in Italy (VACANTE & TROPEA GRAZIA, 1987).

PREVIOUS RECORDS: Algeria, Benin, Brazil, Burundi, Canary Islands, Cape Verde, Egypt, Georgia, Greece, Israel, Italy, Kenya, Lebanon, Madeira Islands, Madagascar, Malawi, Morocco, Nigeria, Portugal, Rwanda, South Africa, Sudan, Tanzania, Turkey, Georgia, Zaire, Zimbabwe (MORAES *et al.*, 2004).

SPECIMENS EXAMINED: Chott-Mariem, ESHE, 13 ♀ + 4 ♂ on *Citrus* sp., IV 2000.

Neoseiulus barkeri Hughes

Neoseiulus barkeri Hughes, 1948: 142, and 1976: 343;
Typhlodromus barkeri Nesbitt, 1951: 35;
Typhlodromus barkeri Chant, 1959: 61;
Amblyseius barkeri Athias-Henriot, 1961: 440;
Amblyseius mckenziei
Schuster & Pritchard, 1963: 268.

This species has been used largely in the last twenty years in experiments for biocontrol of thrips, particularly the onion thrips *Thrips tabaci* Lindeman (HANSEN & GEYTI, 1987; HANSEN, 1988; BRODSGAARD & HANSEN, 1992) and the western flower thrips, *Frankliniella occidentalis* Pergande. It has been commercially mass-produced in Europe since the beginning of the 1980's (RAMAKERS & LIEBURG, 1982). Selection for non-diapause strains was also carried out (VAN HOUTEN *et al*., 1995). As a thrips predator, it is known to be more effective on first stage larvae of its preys (BAKKER & SABELIS, 1986). *N. barkeri* was reported in vineyards in Sicily (RAGUSA & CIULLA, 1989) and France (KREITER *et al.*, 2000) and in various crops in Greece (PAPAIOANNOU-SOULIOTIS *et al.*, 1994). *N. barkeri* is widespread throughout the world (MORAES *et al.*, 1986), and the biological characteristics have been documented because of its use in controlling thrips on Cucurbitaceae in greenhouses (CASTAGNOLI, 1989). It also feeds on red spider mites and eriophyid mites (MOMEN, 1995). This species was found in Israel on *Citrus* sp. (PORATH & SWIRSKI, 1965).

PREVIOUS RECORDS: Algeria, Australia, Brazil, Canary Islands, Cape Verde, China, Finland, France, Georgia, Germany, Ghana, Guinea, Hawaï, India, Israel, Japan, Jordan, Italy, Ivory Coast, Madagascar, Mozambique, Netherlands, Nigeria, Norway, Reunion Island, Russia, South africa, South Korea, Spain, Tahiti, Taiwan, Turkey, Ukraine, United Kingdom, USA, West Bank, Yemen (MORAES *et al.*, 2004).

SPECIMENS EXAMINED: Palmeraie Ibn Chabbat, 2 ♀ on *Cynodon dactylon*, VII 2000.

Neoseiulus californicus (McGregor)

Typhlodromus californicus McGregor, 1954: 89.

N. californicus has been mentioned in various crops in Spain (FERRAGUT *et al.*, 1983; GARCIA MARI *et al.* 1985 , 1986; VILLARONGA *et al.*, 1991), Italy (NICOTINA & CIOFFI, 1997), France (KREITER *et al.*, 2000) and Greece (PAPAIOANNOU-SOULIOTIS *et al.*, 1994).

This widespread species (MORAES et al., 1986), which McMurtry and Croft (1997) consider to be specialised, migrates from the grassy layer to fruit trees or grapevines and vice-versa (RAWORTH *et al.*, 1994; AUGER *et al.*, 1999). It is a specialist predator of *T. urticae* on annual plants and woody species, and of *P. ulmi* (and perhaps eriophyid mites) on trees and less frequently on grapevines. These biological features have only recently been studied (CASTAGNOLI & SIMONI, 1991 & 1994; CASTAGNOLI *et al.*, 1995; AUGER *et al.*, 1999).

PREVIOUS RECORDS: Algeria, Argentina, Brazil, Chile, France, Guatemala, Japan, Peru, Spain, Uruguay, USA (MORAES *et al.*, 2004).

SPECIMENS EXAMINED: Chott-Mariem, ESHE, 22 ♀ + 9 ♂ on *Convolvulus arvensis*, IV 2000.

Neoseiulus cucumeris (Oudemans)

Typhlodromus cucumeris Oudemans, 1930: 69 ;
Typhlodromus (*Amblyseius*) *cucumeris*,
Chant 1959: 78 ;
Amblyseius cucumeris, Athias-Henriot, 1957: 336.

PREVIOUS RECORDS: Numerous records, including Europe, Middle East, North Africa, Asia, North America, Australia (MORAES *et al.*, 2004).

SPECIMENS EXAMINED: Palmeraie Ibn Chabbat, 2 ♀ on *Cynodon dactylon*, VII 2000; Palmeraie de Chekmo, 3 ♀ + 1 ♂ on *Cynodon dactylon*, VII 2000; Palmeraie de M'Rah Lahouara, 1 ♂ on *Digitaria communata*, 1 ♀ + 1 ♂ on *Cynodon dactylon*, VII 2000; Palmeraie de Tozeur, 1 ♀ on *Cynodon dactylon*, VII 2000.

***Neoseiulus mumai* (Denmark)**

Cydnodromus mumai Denmark, 1965: 91;
Neoseiulus mumai (Denmark):
Muma & Denmark, 1971: 10;

Amblyseius mumai (Denmark), Schicha, 1981: 209. The biology of this species remains unknown. It seems common on various herbaceous plants (MORAES *et al.*, 2004).

PREVIOUS RECORDS : Brazil, Hawaï, USA (MORAES *et al.*, 2004).

SPECIMENS EXAMINED : Palmeraie de Tozeur, 1 ♀ on *Cynodon dactylon*, VII 2000.

REMARKS: this is the first record of this species in Africa.

***Neoseiulus paspalivorus* (DeLeon)**

Typhlodromus paspalivorus DeLeon, 1957: 143;
Neoseiulus paspalivorus (DeLeon),
Muma & Denmark, 1971: 110;
Amblyseius paspalivorus (DeLeon),
Schicha, 1981: 210.

The biology of this species remains unknown. It seems common on various herbaceous plants (MORAES *et al.*, 1986, 2004).

PREVIOUS RECORDS: Gualeloupe (MORAES *et al.*, 1999), India, Jamaica, Philippines, USA (MORAES *et al.*, 2004).

SPECIMENS EXAMINED: Palmeraie de M'Rah Lahouara, 2 ♀ on *Cynodon dactylon*, VII 2000.

REMARKS: this is the first record of this species in Africa.

***Typhloseiella isotricha* (Athias-Henriot)**

Amblyseius isotricha Athias-Henriot, 1958b: 37-38.

This species has been described from Algeria on *Inula viscosa* L., in 1958. Since now, it has been reported only under Mediterranean climatic conditions. Furthermore, in the present survey, this species is recorded on *I. viscosa*, where this species has nearly exclusively been found since now (MORAES *et al.*, 2004; TIXIER *et al.*, 2000 and 2003). Specific relationships could occur between this mite and *I. viscosa*, this plant being especially sticky, odorant, with hairy leaves. But the relationships have not been investigated.

PREVIOUS RECORDS: Algeria, Canary Islands, France, Greece, Israel, Jordan, Lebanon, Portugal, Morocco (; Tixier *et al.*, 2000 and 2003; Moraes *et al.*, 2004).

SPECIMENS EXAMINED: Matmata, 4 ♀ on *Inula viscosa*, V 2001

Phytoseiinae

***Phytoseius finitimus* Ribaga**

Phytoseius finitimus Ribaga, 1902: 178;
Phytoseius finitimus
Ribaga, Duso & Fontana, 2002: 130-135.

The individuals found in Tunisia belong probably to the species *P. finitimus* which is confused in other studies with *Phytoseius plumifer* Canestrini & Fanzago. A big confusion between these 2 species has existed during a long time and a tentative solution has been proposed by Duso and Fontana (2002).

Specimens belonging probably to *P. finitimus* (but this has to be confirmed) has already been reported on grapevines in Spain (FERRAGUT *et al.*, 1985; VILLARONGA *et al.*, 1991), Hungary (DELLEI & SZENDREY, 1991), Italy (LIGUORI, 1980; CORINO, 1985; CASTAGNOLI & LIGUORI, 1986; DUSO & REN, 1997), Portugal (CARMONA & FERREIRA, 1989), Greece (PAPAIOANOU-SOULIOTIS *et al.*, 1994) and France (KREITER *el al.*, 2000). *P. finitimus* seems to feed on *P. ulmi* (DUSO & MORETTO, 1994) and various eriophyid mites (RASMY & EL-BANHAWY, 1974b), and it consumes pollen (ZAHER *et al.*, 1969; RASMY & EL-BANHAWY, 1975). Local conditions in Corsica, i.e. high relative humidity and very hairy-leaved grapevine varieties, seem to be very suitable for this species (Rasmy & El-Banhawy, 1974a; Duso & Moretto, 1994; Kreiter *el al.*, 2000). Several experimental introductions have been carried out in Corsica in various productive vineyards (Salva, unpublished data). As also noted for *Kampimodromus aberrans* (Oudemans), side effects of pesticides on this species have only been investigated in the field (Sentenac *et al.*, 2002). This species was also found on *Citrus* sp. in Spain (Ferragut *et al.*, 1983; Garcia Mari *et al.* 1985).

Previous Records: Algeria, Egypt, France, Greece, Iran, Israel, Italy, Montenegro, Russia, Spain, Turkey, USA, Yugoslavia (Moraes *et al.*, 2004).

Specimens examined: Palmeraie de Tozeur, 2 ♀ + 1 ♂ on *Ficus carica*, VII 2000.

Typhlodrominae

***Africoseiulella flechtmanni* Kreiter**

Africoseiulella flechtmanni Kreiter, 2006: *in* Kreiter & Tixier, 2006

The biology of this species remains unknown.

Specimens examined: Palmeraie de Chekmo on an unknown host plant, VII-2000, 27 females, 3 males and 2 deutonymphs.

***Paraseiulus soleiger* (Ribaga)**

Seiulus soleiger Ribaga, 1902: 176; *Paraseiulus soleiger* (Ribaga), Chant & Yoshida Shaul, 1982: 3027.

This species is very widespread throughout the Palearctic region but its biological characteristics have yet to be documented. Kropczynska *et al.* (1988) investigated the development of this species. It seems to be an arboreal generalist predator, feeding preferentially on red spider mites. Kropczynska *et al.* (1988) concluded that it was the only species that could control spider mite populations on lime trees under their study conditions in Poland.

Previous Records: Europe, North America, China, Japan (Moraes *et al.*, 2004).

Specimens examined: Chott-Mariem, ESHE, 1 ♀ on *Convolvulus arvensis*, IV 2000.

***Typhlodromus* (*Anthoseius*) *kazachstanicus* Wainstein**

Typhlodromus kazachstanicus Wainstein, 1958: 201.

The biology of this species remains unknown. It seems common on various trees (Moraes *et al.*, 2004), especially vines and Rosaceae.

Previous Records: Armenia, Georgia, Iran, Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Uzbekistan (Moraes *et al.*, 2004)

Specimens examined: Palmeraie Ibn Chabbat, 1 ♀ on *Ficus carica*, VII 2000; Palmeraie de Tozeur, 3 ♀ + 2 ♂ on *Vitis vinifera*, VII 2000.

Conclusion

Among the 12 species collected, a new genus and a new species for Science were found, and among the 11 species already known, 4 are new for Tunisian fauna. The number of reported phytoseiid mites is now of 19 species. The species found are mainly Palearctic, some having specific Mediterranean distribution. Two species are newly recorded in Africa and in the Palearctic region (*N. mumai* and *N. paspalivorus*).The total number of species is probably strongly underestimated if compared to fauna from Algeria and Morocco. New surveys are consequently needed.

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