

SCIENTIFIC NOTE

Predatory Mites Associated with *Tetranychus evansi* Baker & Pritchard (Acari: Tetranychidae) on Native Solanaceous Plants of Coastal Pernambuco State, Brazil

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Neotropical Entomology 34(4):689-692 (2005)

Ácaros Predadores Associados a *Tetranychus evansi* Baker & Pritchard (Acari: Tetranychidae) em Solanáceas Nativas do Litoral de Pernambuco

RESUMO - Avaliou-se a ocorrência do ácaro vermelho do tomateiro (*Tetranychus evansi* Baker & Pritchard) e de ácaros predadores em quatro das espécies mais abundantes de solanáceas nativas do litoral de Pernambuco. Foram feitas coletas mensais de amostras de plantas de meados de setembro de 2002 a fins de maio de 2003, nos municípios de Aliança, Carpina, Camaragibe, Goiana, Igarassu e Recife. Foram encontrados 5.485 ácaros pertencentes a mais de 27 espécies, das quais as mais numerosas foram as espécies fitófagas *T. evansi* e *Brevipalpus phoenicis* (Geijskes) (Tenuipalpidae), e as espécies predadoras *Asca* sp. (Ascidae), *Phytoseius guianensis* De Leon e *Paraphytoseius orientalis* (Narayanan, Kaur & Ghai) (ambos Phytoseiidae). Índices de associação negativos foram determinados entre *T. evansi* e quatro espécies de fitoseídeos predadores [as três mais numerosas encontradas neste estudo assim como *Phytoseiulus macropilis* (Banks)]. Foram também realizados testes em laboratório para se avaliar a aceitação de *Tetranychus urticae* Koch e *T. evansi* como presas àqueles predadores. Apenas *P. macropilis* sobreviveu e ovipositou adequadamente quando alimentado com *T. urticae*. Embora conseguissem se manter vivos por alguns dias quando alimentados com *T. evansi*, os níveis de reprodução dos quatro predadores foram muito baixos. Esses resultados indicam que embora encontrados comumente sobre solanáceas no campo, aqueles predadores alimentam-se muito pouco ou não se alimentam de *T. evansi* na natureza.

PALAVRAS-CHAVE: Controle biológico, Phytoseiidae, Solanaceae

ABSTRACT - The occurrence of the tomato red spider mite (*Tetranychus evansi* Baker & Pritchard) and predatory mites on four of the most abundant native solanaceous plants in coastal Pernambuco, Brazil, was evaluated. Monthly samples were collected from mid September 2002 to late May 2003 in Aliança, Carpina, Camaragibe, Goiana, Igarassu and Recife. A total of 5,485 mites of more than 27 species were found, of which the most common were the phytophagous species *T. evansi* and *Brevipalpus phoenicis* (Geijskes) (Tenuipalpidae), and the predaceous species *Asca* sp. (Ascidae), *Phytoseius guianensis* De Leon and *Paraphytoseius orientalis* (Narayanan, Kaur & Ghai) (both Phytoseiidae). Negative indexes of association were determined between *T. evansi* and each of four species of predaceous phytoseiids [i.e., the three most numerous species found in this study as well as *Phytoseiulus macropilis* (Banks)]. Laboratory tests were also conducted to evaluate the acceptability of *Tetranychus urticae* Koch and *T. evansi* as prey by the four predatory species. Only *P. macropilis* survived and oviposited well when fed *T. urticae*. Although they were able to remain alive for some days when fed *T. evansi*, the reproduction levels of the four predator species were very low. These results suggest that despite being commonly found on solanaceous plants in the field, these predators feed very little or do not feed at all on *T. evansi* in nature.

KEY WORDS: Biological control, Phytoseiidae, Solanaceae

The tomato red spider mite, *Tetranychus evansi* Baker & Pritchard, was originally described from specimens collected in Mauritius Island in 1960. It has since been reported in the USA and Brazil (Bolland *et al.* 1998), and more recently in eastern and southern Africa (Knapp *et al.* 2003), Spain and Portugal (Ferragut & Escudero 1999, Bolland & Vala 2000). It has been reported as pest of several solanaceous crops (Jeppson *et al.* 1975, Moraes & McMurtry 1985).

There is a tendency to replace the common use of chemicals in pest control by the use of natural enemies. Usually, most effective natural enemies of a given pest species are expected to be found in the place of origin of the latter. The place of origin of *T. evansi* is not known, but South America is a possible region. Studies are being carried out in this region to determine the feasibility of controlling this pest in Africa through classical biological control, which involves the introduction of prospective natural enemies collected in the place of origin of the pest.

The objective of this study was to determine the occurrence of *T. evansi* predatory mites and other mites on common native solanaceous plants in the coastal region of Pernambuco State, northeastern Brazil. Another objective of the study was to evaluate the suitability of *T. evansi* as prey for the most common mite predators found in the survey as well as for *Phytoseiulus macropilis* (Banks), a specific predator of tetranychid mites.

Monthly samples were collected from mid September 2002 to late May 2003 in Aliança, Carpina, Camaragibe, Goiana, Igarassu and Recife. Each sample consisted of 40 leaves of different ages of *Solanum americanum* Mill. (Recife), *S. stramonifolium* Jacq. (Recife), *S. paludosum* Moric. (Igarassu and Goiana) and *S. paniculatum* L. (Aliança, Carpina, Camaragibe, Goiana, Igarassu and Recife). The leaves were taken to the laboratory in plastic bags kept in styrofoam boxes at 10°C to prevent mites from escaping. All mites were mounted and identified by the second and fourth authors.

The index of association of *T. evansi* with each of the three most frequent predaceous mites found in this study as well as with *P. macropilis* (Banks) was calculated according to Wittaker & Fairbanks (1958). The suitability of *T. evansi* as prey for these species was determined by evaluating the survivorship and the oviposition rate of each of the predators when offered *T. evansi* as prey under laboratory conditions, at 26°C, 65-70% RH and 12h L/12h D photoperiod. For comparison, the same parameters were investigated with *Tetranychus urticae* Koch as prey. Predatory mites used for the laboratory observations were collected from *S. paniculatum* on the campus of Universidade Federal Rural de Pernambuco, between January and March 2003. Twenty females of each predatory species were individually confined on leaf discs (2 cm in diameter, floating in petri dishes filled with water) of either *S. americanum* initially containing 10 females of *T. evansi* or *Canavalia ensiformis* (L.) DC., initially containing 10 females of *T. urticae*; because of continuous oviposition by *T. evansi* and *T. urticae* females, eggs of those species were also available on the discs. Eggs of the predator were counted and discarded daily and each surviving adult predator was transferred to a similar new

leaf disc after five days. Fecundity and survivorship were evaluated during ten days.

The results reported here consider all fields and plant species together. A total of 5,485 mites belonging to more than 27 species of 12 families were found. The following five species corresponded to about 90% of the mites collected: *T. evansi*, *Brevipalpus phoenicis* (Geijskes), *Asca* sp., *Phytoseius guianensis* De Leon and *Paraphytoseius orientalis* (Narayanan, Kaur & Ghai). The first two are phytophagous and the others are predaceous species (Table 1).

T. evansi was the most abundant species, corresponding to about 40% of the mites collected. Its population was more important on *S. americanum*, which harbored alone 94.2% of all *T. evansi* collected. Its highest population level was observed in November. Phytoseiidae was the most diverse family, represented by 17 species. Mites of this family corresponded to about 36% of all mites collected. The most abundant predatory mites encountered were *P. orientalis*, *P. guianensis*, *Asca* sp. and *Phytoseius cismontanus* (De Leon). These predators were found in all sample dates.

Despite the high diversity and abundance of predatory mites on the plant species investigated, these mites were rarely found together with *T. evansi*. This is shown by the highly negative association indexes (Wittaker & Fairbanks 1958) for each of the predators evaluated and *T. evansi*: *Asca* sp.: -0.900, *P. orientalis*: -0.845, *P. guianensis*: -0.864 and *P. macropilis*: -0.975.

All *P. macropilis* were alive at the end of the 10-day observation period when confined with *T. urticae*, whereas other species survived an average of less than three days when offered the same prey species (Table 2). When confined with *T. evansi*, *P. guianensis* and *Asca* sp. survived more than seven days, whereas *P. macropilis* and *P. orientalis* survived less than five days.

Only *P. macropilis* oviposited when confined with *T. urticae*, and the oviposition rate obtained (2.7 eggs/female/day) was comparable to those mentioned by other authors (Prasad 1967, Moraes & McMurtry 1985, Takahashi & Chant 1994, Ali 1998). However, when that predator was confined with *T. evansi*, oviposition was almost zero. Low oviposition rates of *P. macropilis* and *Phytoseiulus persimilis* Athias-Henriot when fed *T. evansi* were reported by Moraes & McMurtry (1985). Similarly, low or no oviposition was observed for any of the other tested species when confined with either *T. urticae* or *T. evansi*, indicating that tetranychids are unsuitable to them as prey (Table 2). In contrast to *Phytoseiulus*, a genus containing species whose biological parameters are well documented, biological information on species of other genera found in this study is scarce. Sanderson & McMurtry (1984) and McMurtry & Croft (1997) reported oviposition rates below one egg per female per day for *Phytoseius hawaiiensis* Prasad fed *Tetranychus pacificus* McGregor. Moraes & McMurtry (1986) reported almost no oviposition when *T. evansi* was offered as prey to the same predator.

No positive association of *T. evansi* with *Asca* sp., *P. guianensis*, *P. orientalis* or *P. macropilis* was observed. The results of the present study suggest that though the species of predatory mites studied share the same habitat with *T.*

Table 1. Monthly numbers of mites on native Solanaceae of the coastal zone of Pernambuco State, Brazil (September 2002 to May 2003).

Mite group	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	N ¹	% ²
ASCIDAE											
<i>Asca</i> sp.	8	34	27	14	21	21	48	16	42	231	4.2
BDELLIDAE											
<i>Bdella</i> sp.	-	-	-	1	-	-	-	-	-	1	*
CHEYLETIDAE											
<i>Hemicheyletia</i> sp.	-	-	2	1	2	1	-	-	1	7	0.1
CUNAXIDAE											
<i>Cunaxoides</i> sp.	-	2	25	10	-	8	4	13	2	64	1.2
DIPTILOMIOPIIDAE											
<i>Rynachus</i> sp.	-	-	-	3	-	-	35	24	-	62	1.1
PHYTOSEIIDAE											
<i>Amblyseius aerialis</i>	3	2	1	1	2	4	6			19	0.3
<i>A. compositus</i>									1	1	*
<i>Euseius alatus</i>	1									1	*
<i>Iphiseiodes zuluagai</i>	2									2	*
<i>Neoparaphytoseius sooretama</i>					11					11	0.2
<i>Neoseiulus</i> sp.				1						1	*
<i>Paraphytoseius orientalis</i>	109	157	81	99	55	17	128	165	141	952	17.2
<i>Phytoseiulus macropilis</i>	1	2								3	0.1
<i>Phytoseius cismontanus</i>	65	18	18	1	4	1	4	1	2	114	2.1
<i>P. guianensis</i>	45	68	102	148	48	87	93	51	138	780	14.2
<i>P. mexicanus</i>		1								1	*
<i>P. woodburyi</i>								7	4	11	0.2
<i>Proprioseiopsis cannaensis</i>										1	*
<i>Typhlodromalus aripo</i>	4	1	1					1	2	9	0.2
<i>T. peregrinus</i>	16	22	2		2		31	13		86	1.6
<i>Typhlodromina subtropica</i>		1	2							3	*
<i>Typhlodromips mangleae</i>	1		1							2	*
STIGMAEIDAE											
<i>Agistemus</i> sp.			1		1					2	*
TARSONEMIDAE											
<i>Tarsonemus</i> sp.			2				2	8	1	13	0.2
TENUIPALPIDAE											
<i>Brevipalpus phoenicis</i>		5	45	292	196	119	86	21	1	765	13.9
TETRANYCHIDAE											
<i>Atrichoproctus uncinatus</i>			2							2	*
<i>Tetranychus evansi</i>		26	1880	2	30	6	125	18	107	2194	40.0
<i>Tetranychus</i> sp.	8		4	1	1				2	16	0.3
TYDEIDAE											
<i>Lorryia</i> sp.			19	11		1	5	12	3	51	0.9
<i>Tydeus</i> sp.				8	5	8	4	6		31	0.6
<i>Pronematus</i> sp.			1		3	1	35	9	1	50	0.9
Total	263	339	2216	593	381	274	606	365	448	5485	100

¹Total number of specimens collected in the study; ²percentage of the total number of mites collected; * less than 0.1%

evansi, they probably do not contribute significantly to the natural control of the pest and, therefore, may not be good candidates for classical biocontrol of *T. evansi* in Africa. Further studies on the effectiveness of other arthropods including predatory mites and predaceous insects associated with mites are necessary. The possible factors involved in the unsuitability of the pest as prey

for predatory mites also need to be investigated.

Acknowledgments

The authors would like to thank the German Federal Ministry for Economic Cooperation and Development (BMZ) and the German Academic Exchange Service (DAAD) for financial support.

Table 2. Survivorship and daily fecundity (mean \pm standard error) of predatory mites associated with native Solanaceae, fed *Tetranychus evansi* or *T. urticae*.

Predator	Survivorship (days)		Fecundity (eggs/female/day)	
	<i>T. evansi</i>	<i>T. urticae</i>	<i>T. evansi</i>	<i>T. urticae</i>
<i>Asca</i> sp.	7.4 \pm 0.65Aa ¹	2.9 \pm 0.62Bbc	0.0 \pm 0.00Ab	0.0 \pm 0.00Ab
<i>Paraphytoseius orientalis</i>	2.7 \pm 0.42Ab	1.3 \pm 0.22Bc	0.1 \pm 0.04Ab	0.0 \pm 0.00Bb
<i>Phytoseius guianensis</i>	7.6 \pm 0.69Aa	3.3 \pm 0.60Bb	0.1 \pm 0.03Ab	0.0 \pm 0.00Bb
<i>Phytoseiulus macropilis</i>	4.6 \pm 0.41Bb	10.0 \pm 0.00Aa	0.3 \pm 0.08Ba	2.7 \pm 0.05Aa

Means followed by the same lower case letter in a column or upper case letter in a line are not significantly different (Tukey test; $P \leq 0.05$).

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Received 26/II/04. Accepted 24/III.05.