

## Comparison of Two Species of Ascid Mites as a Food Source for *Neoseiulus baraki*: A Predatory Mite of Coconut Mite, *Aceria guerreronis*

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### Introduction

Coconut mite, *Aceria guerreronis* Keifer (Acari: Eriophyidae), is a major pest of coconut fruits (*Cocos nucifera* L.) (Lawson-Balagbo *et al.*, 2008) causing 30-60% loss of production (Nair, 2002). Coconut mite is difficult to control due to its hidden habitat under the perianth and tall stature of the coconut tree. Chemical control is impractical, uneconomical, and environmentally not sound (Navia *et al.*, 2012). Release of the predatory mite *Neoseiulus baraki* at 3-4 month intervals at 5000 mites per palm for at least a quarter of the plantation is recommended. For this, mass production of *N. baraki* is necessary. *Tyrophagus putrescentiae* is used as the food source for *N. baraki*. A new *Tyrophagus* sp. which can be a host for *N. baraki* has also been observed, but the efficacy of this new species has not been evaluated. Therefore the objectives of this study were to compare the oviposition, developmental times, longevity and sex ratio of *N. baraki* on *T. putrescentiae* and new *Tyrophagus* sp. and to quantify the mass production of *N. baraki* on the two *Tyrophagus* sp.

### Methodology

In experiment 1, the effect of *T. putrescentiae* and new *Tyrophagus* sp. on juvenile development of *N. baraki* was tested. Mother cultures of *N. baraki*, *T. putrescentiae* and new *Tyrophagus* sp. were cultured at 26°C as described by Aratchige *et al.* (2010). Petri plates filled with water-saturated cotton wool layer were used. A piece of black sheet was placed on the cotton wool layer and were wetted 2–3 times a week. Thirty adult females of *T. putrescentiae* and new *Tyrophagus* sp. of different ages were placed in separate Petri dishes, and eggs were collected twelve hours after the introduction of *Tyrophagus* spp. Each egg was transferred to a separate Petri plate, and maintained at 24°C and 70% relative humidity (RH). Each treatment was replicated twelve times. Petri dishes were observed daily, and the changes in life stages, development period for each life stage, duration of each juvenile stage (days), total development time of juveniles (days), total number of eggs per female and adult longevity (days) in *N. baraki* were determined.

In experiment 2, the effect of *T. putrescentiae* and new *Tyrophagus* sp. to mass produce *N. baraki* was studied. Forty tray-type arenas were prepared for maintaining mother cultures (Aratchige *et al.*, 2010). Initially, *T. putrescentiae* and the new *Tyrophagus* sp. (hundred from each species) were introduced separately to each arena. Two weeks later (when approximately one thousand from each species were present), twenty adult females of *N. baraki* were introduced in to each arena, and tray was covered with another inverted tray to prevent contamination. Each treatment was replicated four times. All arenas were randomly distributed and maintained at 27±10°C, 70% RH for 6 weeks. As the total number of *N.*

*baraki* in the arenas was difficult to be counted, the number of mites in 600 cm<sup>2</sup> was determined weekly by counting the number of motile stages.

In experiment 1, the effect of *T. putrescentiae* and the new *Tyrophagus* sp. on oviposition, developmental times, longevity and sex ratio of *N. baraki* were analyzed using Proc Mixed procedure of SAS (SAS Institute, 2002-2008). Duration for the development of larval stage was not analyzed as the same duration was recorded for all individuals. In experiment 2, number of *N. baraki* emerged on *T. putrescentiae* and the new *Tyrophagus* sp. were counted. All the data were log-transformed [ln (x+1)] prior to being analyzed by repeated measures of ANOVA using SPSS software (version 15). This was done as the repeated data were obtained from the same tray type arenas throughout the experiment. Means were compared using LSD.

### Results and Discussion

The development of any of the life stages of *N. baraki* was not affected by the two *Tyrophagus* spp. tested. (Table 1). *Tyrophagus putrescentiae* is currently used in Sri Lanka to mass produce *N. baraki* in the laboratory. Although its suitability for the mass production of *N. baraki* has been identified (Aratchige *et al.*, 2010), detailed studies on its effect on life table parameters of *N. baraki* has not yet been documented. However, in this study the survivorship of different stages, intrinsic rate of increase and net reproductive rate of *N. baraki* on the food sources tested could not be determined due to unavailability of sufficient number of replicates.

Table 1. Developmental times (mean±SE) of *Neoseiulus baraki* reared on *Tyrophagus putrescentiae* and new *Tyrophagus* sp. at 24<sup>0</sup>C and 70% RH

Stage/biologic al factor of <i>N. baraki</i>	Developmental time (days)		Degrees of freedom	F value	P value
	Food source				
	<i>T. putrescentiae</i>	New <i>Tyrophagus</i> sp.			
Egg	1.79±0.06 (N=44)	1.81±0.07 (N=37)	1	0.029	0.865
Protonymph	2.22±0.07 (N=45)	2.05±0.71 (N=38)	1	3.634	0.06
Deutonymph	1.59±0.08 (N=44)	1.69±0.08 (N=39)	1	0.967	0.328
Egg to adult	6.60±0.09 (N=35)	6.57±0.10 (N=30)	1	0.035	0.852
Number of eggs	9.23±0.98 (N=35)	10.96±1.08 (N=29)	1	0.309	0.581
Adult longevity	20.20±0.834 (N=35)	20.72±0.92 (N=29)	1	0.002	0.968
Sex ratio	82.2±2.82 (N=34)	78.5±3.16 (N=27)	1	0.505	0.48

Means in a row are not significantly different if P>0.05.

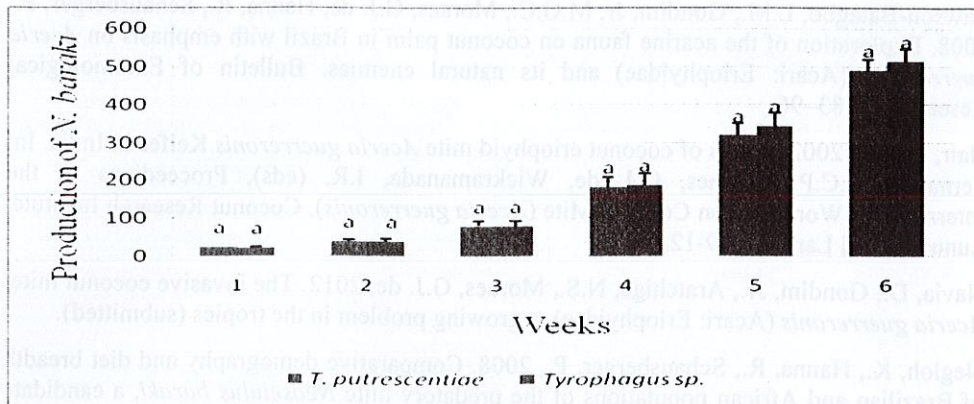


Figure 1. Production of *Neoseiulus baraki* (mean±SE) at weekly intervals on *Tyrophagus putrescentiae* and new *Tyrophagus sp.* at 24°C and 70% RH.

In a given week, columns with the same letter are not significantly different at  $P=0.05$ .

Production of *N. baraki* on *T. putrescentiae* or the new *Tyrophagus sp.* did not vary significantly during the six-week study period following introduction of *N. baraki* ( $df=1$ ,  $F=0.028$ ,  $P=0.867$ , Figure 1). However, a 242-fold increase of *N. baraki* is reported when *T. putrescentiae* is used as the food source (Aratchige *et al.*, 2010). As a food source for *N. baraki*, *Aceria guerreronis* is superior to *T. putrescentiae* (Aratchige *et al.*, unpublished data) and to other food sources such as *Tyrophagus urticae* eggs; pollen of maize, coconut and castor bean (Negloh *et al.*, 2008), but cannot be used as it can only be reared on coconuts or on embryo-cultured seedlings (De Silva and Fernando, 2008).

## Conclusions

The two species *T. putrescentiae* and the new *Tyrophagus sp.* did not show a differential effect on the development of life stages, longevity, sex ratio and mass production of *N. baraki*. Therefore, both *Tyrophagus spp.* are equally suitable and can be used to mass produce *N. baraki*. The use of new *Tyrophagus* species would enhance mass production of *N. baraki* in the laboratory to control the coconut mite *Aceria guerreronis*. It would be worthwhile to retest the development of *N. baraki* protonymphs on two *Tyrophagus spp.*, as the difference was marginal. The survivorship of different life stages, the intrinsic rate of increase and the net reproductive rate of *N. baraki* on two *Tyrophagus* species are also important areas for future research.

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