Some Aspects of Biology of Predatory Mite (*Proctolalaeps bickleyii*) of Coconut Mite

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ABSTRACT

The study was conducted to determine the life cycle of *Proctalaelaps bickleyii* and to investigate whether *P. bickleyii* feed on the local predatory mite *Neoseiulus baraki* in the presence of *Aceria guerreronis*. The life cycle consisted of five stages; egg, larva, protonymph, deutonymph and adult. Length of the life cycle from egg to adult was 8-10 days at 27^{0}C. The second investigation was carried out to check whether *P. bickleyii* feeds on the local predatory mite *N. baraki* in the presence of *A.guerreronis*. *P. bickleyii* is fed on *N.baraki* even in the presence of A. *guerreronis* 2.8 mean number of *N.baraki* were consumed during 3 hours period of time. Therefore *p. bickleyii* is not suitable as a biological agent of *A. guerreronis* because they most preferred to predate on *N.baraki* than *on A.guerreronis*.

KEY WORDS: Biological Control, *Proctalaelaps bickleyii, Aceria guerreronis, Neoseiulus baraki*

INTRODUCTION

The mite *Aceria guerreronis* Keifer is one of the main pests that affect coconut (*Cocos nucifera*) plantations in many countries. *A.guerreronis* was first reported from the Gurrero state of Mexico in 1965. It has been a serious pest of coconut in America and West Africa for many years recently been reported from Indian sub continent. The coconut mite, *A.guerreronis* was reported for the first time in Sri Lanka in late 1997 (Fernando, 1998). The pest appeared for the first time in Kalpitiya peninsula of the northwestern province & subsequently spread to about 15000ac of the surrounding areas causing out break. Currently nearly 55000ha are affected (Fernado, 1998).

Coconut mite *A.guerreronis* feeds on young merisematic tissues under bracts (perianth) of the nut. Nuts of all stages are affected. There is a reduction of mite population with the maturity of the nut (Fernando, 1998). The tightness of the perianth of the nut enhances the susceptibility of the attack. As *A. guerreronis* lives beneath the bracts, it ensures well protection from contact pesticide application and other external factors.

The infestation produces various types of symptoms on developing nuts. They can be categorized sequentially, parallel to development of the nuts. Generally the infested nuts develop triangular creamy white patches that extend from the margin of the parianths. This marks the first visible symptoms. The affected nuts continue to grow without nut fall. As a result of that the triangular white patches extend throughout the entire length of the affected nuts. The color of the feeding patch becomes necrotic. Drying up of parts of the husk and it affects normal development of the nut. As a result of the severe damage, the size of the nut reduces and some times malforms. Such nuts contain a smaller kernel and less copra. Immature nut fall is common due to this damage and the reduction of husk quality may create difficulties for husk processing.

Although there have been many attempts to control *A.guerreronis*, no successful and sustainable method has yet been developed. As far as the biology and ecology of the *Aceria guerreronis* is considered it is found to be very difficult to control the pest using common methods.

Effectiveness of several insecticides against *A.guerreronis* has been evaluated. But none has given complete control of the pest. Except a 30% mixture of used engine oil. Also neem, garlic and soap mixture and neemgarlic T/S have given nearly 60% reduction in the pest population. Also the endopathogenics fungus *Hirsutella thompsoni* has being considered a prospective agent (Fernando, 1998). However chemical methods have lots of disadvantages. Therefore the attention is to be paid on developing biological control method as the present best alternative.

Several species of predatory insects and mites have been found in an association with *A.guerreronis* in different parts of the world. e.g., *Bdella indicata, Bdella distincta, Neoseiulus mumai, Neoseiulus paspalivorus, Neoseiulus baraki (Fernando, 1998).*

In the sub order mesostigmata, Howard *et al.*, (1990) mentioned unidentified specie of Lasioseius (Ascidae), but did not inform whether it preys the pest. Cabrera *et al.*, (1992) reported the unidentified species as *Proctalaelaps bickleyii* (brame). Estebnes Gonzalez (1976) also reported the occurrence of *Proctalaelaps bickleyii*, as an unidentified species. Otero Colina also reported another species of the genus Proctalaelaps in 1986. Estebanes Gonzales (1976) founds that high population level of *Proctalaelaps bickleyii* associates with high number of dead and low number of live *A.guerreronis (Fernando, 1998). N.paspalivorus* and *N. baraki* is reported predatory mite in Sri Lanka (Fernando, 1998). This experiment was conducted to determine the life cycle of the *P. bickleyii* and to investigate whether *P. bickleyii* feed on the local predatory mite *Neoseiulus baraki* in the presence of *A.guerreronis*. These aspects may help to make further experiments about the *P.bickleyii*.

METHODOLOGY

Life Cycle of Proctalaelaps bickleyii

Twenty five arenas were used for rearing *P.bickleyii*. First a square shape sponge (5 cm x 5 cm) was placed on a petridish and wax coated black paper was placed on the top. The square was framed by a 0.5 cm wide moistened tissue paper to prevent the escape of *P.bickleyii*. Culture arena was checked and the eggs were removed daily. Twenty five eggs were selected. Each egg was transferred to a separate arena and covered with cover slips. Then arenas were placed in a plastic tray of 45 cm x 30 cm x 6 cm. After covering with another plastic tray, it was kept in an incubator at 27^0 C and 80-85 RH for the development.

During the experiment, each petridish was examined twice a day. Duration and each development stages of the life cycle were recorded until attained the adult stage.

Feeding of P.bickleyii on the Local Predator N.baraki in the Presence of A.guerreronis

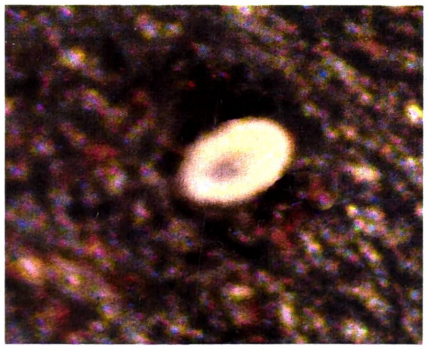
An adult female of *P.bickleyii* was placed on a single arena and a large number of *A. guerreronis* were introduced. Ten adults of *N.baraki* were also introduced. The number of *N. baraki* fed by *P.bickleyii* was determined by observing them three times a day. Observation was made for an hour under stereomicroscope. The numbers of *N.baraki* fed by *P.bickleyii* during the 3-hour periods were recorded. This experiment was conducted for ten days.

RESULT AND DISCUSION

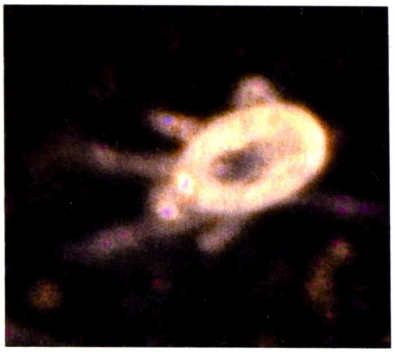
Life Cycle of P.bickleyii

Length of the life cycle from egg to adult was 8-10 days. Within the life cycle they completed egg, larva, protonymph, deutonymph, and adult stages.

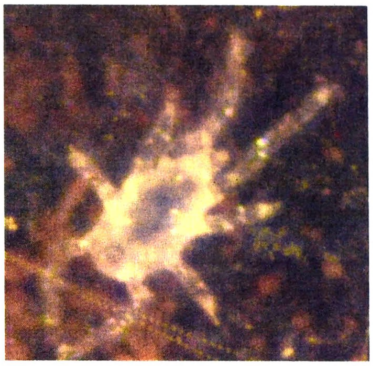
The eggs were usually small in size, elliptical in shape (Fig.1) and hatched in 1.33 days. Three pairs of legs in larva and four pairs of legs in proto and deutonymph have been observed. No consistently reliable qualitative characteristics were identified to distinguish between protonymph & deutonymph stages except, quantitative and external morphological differences. Females were often high in numbers than males. Male and female could be distinguished by using external morphology. Females were larger than



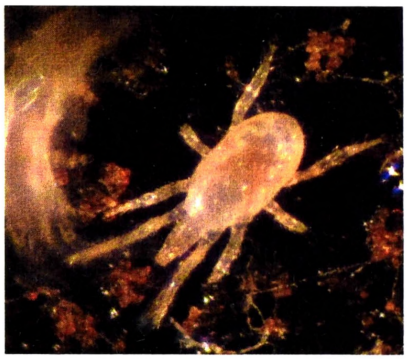
(a) Egg



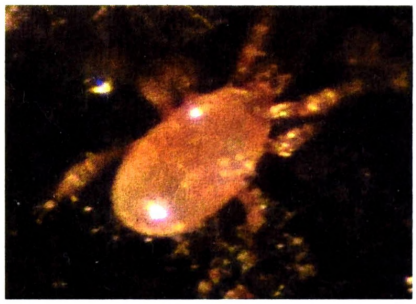
(b) Larva



c) Protonymph



(d) Deutonymph



(e) Adult

Fig.1 Different stages of the life cycle of *Proctalaelaps bickleyii*

males. Males had an elongated body. Rear end of the body of male was elliptical in shape and it was round in female. During the development, eggs hatched in to the first larval stage within 1.33 days. Larval movement was slower compared to the later stages, with white color body and three pair of legs. The larva becomes protonymph within 1.44 days with four pairs of legs and white body. After around 1.59 days the

protonymph becomes deutonymph. It consisted of four pairs of legs and similar to the adult (Fig.1). Color of the body was brownish white. After 5.5 days it attained the adult stage. Adult takes 4 days to lay eggs. The durations of each stage could be summarized in Table 1.

Table1: Mean durations of the different development stages of *P. bickleyii*

Stage of life cycle	Mean number of days ± SE
Eggs	1.33 ± 0.18
Larva	1.44 ± 0.05
Protonymph	1.59 ± 0.12
Deutonymph	5.50 ± 0.59

Even though, *P.bickleyii* bred profusely under natural field condition. Rearing and monitoring the stages until the adult was a difficult task in the laboratory.

Main problem regarding this experiment was the escape of *P.bickleyii* from the arena because *P.bickleyii* was a very active predator than the *N.baraki* and they preferred shade and wet conditions. They hide under the wet tissues and under the sponge. Such difficulties and problems were to be overcome by the improvement of the arena that prevents the escape of predator.

Feeding of P.bickleyii on the Local Predator N.baraki in the Presence of A.guerreronis

Table 2 shows the mean number of *Neocilus baraki* fed by *P.bickleyii* in the 3-time duration

Table 2: Mean number of *N.baraki* fed by *P.bickleyii* during three-time duration

Time duration	Mean number of N.baraki fed by the P.bickleyii ± SE
9-10 am	2.3 ± 0.33
12-1 pm	0.5 ± 0.24
3-4 pm	0

The study showed that *P.bickleyii* feeds on the *N.baraki* even in the presence of abundant *A.guerreronis*. Significantly high number of *N.baraki* fed by the *P.bickleyii*, in the first observation period compared to other two. The *P.bickleyii* fed no significant amounts of *N.baraki* in last time duration (3 – 4 pm). In the all ten replicates above amount was close to zero. In the middle time duration (12 –1 pm), there was somewhat significant amount than the last time duration. The female of the predator was taken from predator culture which had enough *A guerreronis* as food. So it was assumed that they required less food in the morning or before the experiment. But when the experiment was commenced, in the first time duration, they ate more *N.baraki* instead of *Aceria guerreronis*. Even had excess amount of *Aceria guerreronis* the *P.bickleii* preferred to eat *N.baraki*. They rarely ate one or two *Aceria guerreronis* in the one-hour duration.

CONCLUSIONS

Life cycle of the *Proctalaelaps bickleii* consisted of 5 stages i.e. egg, larva, protonymph, deutonymph and adult. Length of life cycle from egg to adult was 8-10 days. It is suggested that *P.bickleii* that is not a suitable candidate for biological control for *A.guerreronis*, because they most preferred to predate on *N.baraki* than *on A.guerreronis*.

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