Increase Rate of The Predatory Mite *Neoseiulas Baraki* of Coconut Mite

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ABSTRACT

Coconut mite *Aceria gurreronis* keifer (Acari: Eriphyidae) is a severe problem in Sri Lanka. Studies in Sri Lanka revealed that the native predatory mite *Neoseiulus baraki* Anthios-Hentriot (Acari: Phytoseiidae) is a prospective biological control agent of the coconut mite. Mass rearing of *N. baraki* was proposed to augment the field population. Laboratory studies were conducted to determine the rate of increase of *N. baraki*, which is developed and multiplied satisfactorily on the storage mite, *Tyrophagus putrescentiae* shrank (Acari: Ascidae). Results revealed that the number of adults, immatures and eggs of *N. baraki* increased up to three weeks after introduction and reduced thereafter. A mean number of 22.8 *N. baraki* were produced by a single female at three weeks.

KEYWORDS: *Aceria Gurreronis, Neoseiulas Baraki,* Biological Control

INTRODUCTION

The coconut mite, *Aceria gurreronis* keifer (Acari: Eriophyidae) is a one of the most intractable pests of coconut in the world. Since the first report of it in 1965 from Mexico, it has spread in to many countries in the American and Africa continents and to India and Sri Lanka in 1997 (Fernando, 1998). It was first observed in Kalpitiya, Puttalam District in Sri Lanka (Fernando, 1998). Later the infestation gradually spread in to many other areas and now present in Northern, North-central, Western and Eastern provinces and at low incidence in the Gampaha, Hambantota and Matale districts. No sustainable method has yet been developed to manage the pest successfully.

A.gurreronis develops in the meristematic region of the nuts, which is covered by the perianth (tepals). Damage is caused by feeding, resulting uneven growth of nuts. These nuts get distorted and stunted and fall prematurely. Therefore, the main crop loss occurs in the form of reduced nut fall which has been estimated in the range of 10 – 70 %, depending on the severity of the infestation. It also reported the copra yields of Nuts that are infested are lower than the average (Fernando, 1998).

Therefore, the recent invasion of the coconut mite has raised serious concern not only in Sri Lanka but also in Asia & Pacific region. Coconut is a major plantation crop in these regions and accounts for over 80% of the world coconut production. Since coconut supports to the economies of these countries, the control of this infestation is one of the major issue that is being faced by these countries.

At present, chemical control is the most widespread means used to control the infestation. Highly toxic acaricides/insecticides have to be sprayed on bunches at frequent intervals to surpress the pest. Repeated applications of chemical at 1 – 2 month intervals are uneconomical, impractical and, moreover environmentally hazardous. Therefore, the search for alternative control method is urgently needed. Biological control methods such as the use of entamopathogenic fungus, *Hirsutella thompsonii* fisher has shown some promise, but effective control methods using this fungus have not been developed yet. Several predatory mites of *A. gurreronis* have been recorded from many coconut-growing countries of the world. But, their impact on the coconut mite and potential as biological control agents has not been explored. It has been suggested that *Neoseiulas spp* (Phytoseiidae) have potential as prospective candidates because they do not prefer too much light and their bodies are flat enabling them to creep underneath the tepals of coconuts. In Sri Lanka, *Neoseiulas baraki* was found underneath the bracts of nuts infested with coconut mite. Field studies revealed that the density of *N. baraki* has a strong temporal relationship with the density of coconut mite.

In general, the distribution and density of the predatory mites on nuts have increased over time. Also, field observations indicated that the density of predatory mites found in nature are often not sufficient to effectively reduce the coconut mite density and damage. Therefore, augmenting the field population by releasing laboratory – bred predators need to be attempt to reduce and maintain low levels of coconut mite. Such a programme will require mass – breeding of the predatory mite in the laboratory. Therefore, this study was initiated to improve the mass – breeding of the predatory mite in the laboratory and to investigate the population increase of *N. baraki* during rearing period.

MATERIALS AND METHODS

***Rearing Arenas*:**

The arena consisted of a 12cm × 8cm black paper waxed by dipping in hot bees wax and laid on 2.5cm thick foam of the same size. The foam was wetted with water. Then, it was placed in a 15cm × 10cm dish. Tissue paper strips of 2.5cm wide were wetted with water and they were stretched around the periphery of the wax paper to discourage escape of mites and provide drinking water. Twelve arenas were arranged in two plastic trays (45cm × 35cm). Water levels of the arenas were maintained by adding water regularly.

***Mother Cultures*:**

Six mother cultures were prepared *N. baraki* were collected from the CRI laboratory. *N. baraki* was

reared in the arenas described above. Five females and tow males were introduced on to each arena and were supplied with its laboratory host *Tyrophagus putrescentiae*. Rice bran mixed with wheat flour was given as food for *T. putrecentiae*. The arenas were kept in an incubator at a temperature 27 ± 0.5°C and 85 – 95 % RH.

Experiment :

Twelve arenas were prepared to determine the rate of increase of *N. baraki*. The arenas were prepared as described above. Five females and two males collected from the mother culture were introduced on to each arena. The experiment was conducted for five weeks. The number of *N. baraki* was counted separately as adults, immature and eggs. The counting was conducted every week by using a stereomicroscope. The adults and immature were transferred in to the new rearing arena and after two days the hatched eggs also transferred to the same new rearing arena. Likewise, the number of adults, immature and eggs were counted week by week. This process was continued for five weeks.

RESULTS AND DISCUSSION

Rate of increase of the predatory mite *N. baraki* was determined by using descriptive statistics. The number of all stages of *N. baraki* increased exponentially up to three weeks and reduced thereafter (Figure 1)

The mean number of all stages at three weeks per arena or five females was 113.8. The standard error was 17.3 in this experiment. A mean number of 22.8 *N. baraki* were produced by a single female at three weeks. According to the results, the best time to collect *N. baraki* for releasing in the field to augment the coconut mite, *Aceria gurreronis* is at three weeks after introduction. (Figure 2)

There are several reasons for the reduction in population after three weeks. It could be due to competition among the *N. baraki* and *T. putrescentiae* which were highest in the rearing arenas at three weeks or the escape of *N. baraki* from arenas or rice bran residues in the rearing arenas which reduced their activity. Several scientists haye mentioned about the cannibolism among mites (Fernando, 2005) which could be another reason for the reduction of *N. baraki* population.

To maximize the *N. baraki* population, the following precautions could be followed. During the rearing of arena, over watering was observed to be a severe problem. Therefore, watering should be maintained at once in three days. Rice bran with flour should be given every three days at 1: 1 ratio for the *T. putrescentiae*. Otherwise, they reduce their population due to lack of food. Thus it may lead to the reduction of *N. baraki* population. It is also important to put the masking tape on the arena dish to avoid the escaping of *N. baraki* and *T. putrescentiae*. The arenas and tools should be kept very clean to avoid the contamination by undesired organisms. If above conditions are properly given, the continuoes rearing of a large number of *N. baraki* could be well attained.

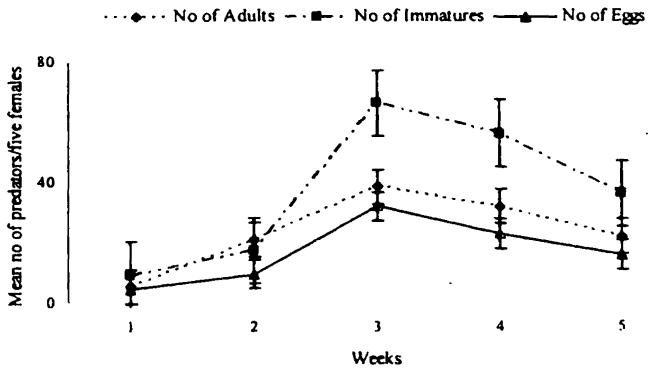

Figure 1. Population increase of all stages of *N. baraki* over five weeks

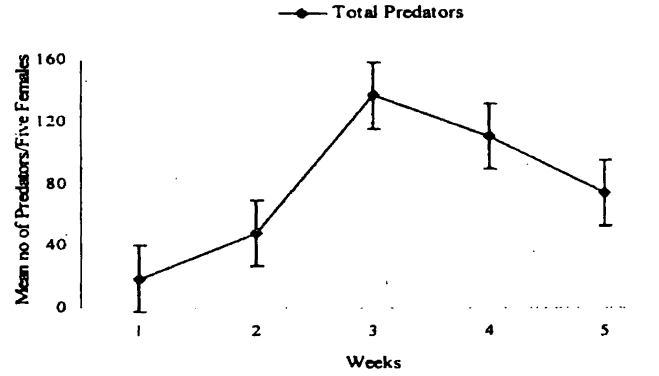

Figure 2. Population increase of three stages of *N. baraki* over five weeks

ACKNOWLEDGEMENTS

Authors are grateful to Prof. S. J. B. J. Jeyasekera, Dean, Faculty of Agriculture and Plantation Management and Prof. N. E. M. Jeyasekera, Head, Department of plantation management for their valuable suggestions and encouragement. Authors would also like to thank staff of Crop Protection Division of the Coconut Research Institute for assisting in the study. The help given by staff members of the computer unit of Wayamba University of Sri Lanka is also greatly appreciated

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