

# Is Coconut Mite on the Declining Trend in Kerala?

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**Abstract:** The coconut mite, *Aceria guerreronis* (Keifer) has attained the status of a devastating pest of coconut in coconut growing parts of India during the later parts of 1990s. Current study has evaluated the population trends of the mite on highly susceptible variety of coconut, Chowghat green dwarf for three years from 2011-2013 in Calicut University campus and surrounding areas. Estimation of population density of the mite was carried out by counting of mites in the meristematic zone of the infested nuts plucked from the trees at biweekly intervals. Annual seasonal fluctuation of the population density of the mite was observed with higher density during January – May and lower density during June- August. Further, an overall decline in the population density was recorded across all seasons from 2011-2013. This phenomenon would revive coconut production and improve the economy of coconut farming and other coconut based industries in Kerala.

**Keywords:** Chowghat green dwarf, *A. guerreronis*, rain fall, temperature, economic loss

## 1. Introduction

Coconut is a plantation crop and cultivated in more than 93 countries. Global acreage of this plantation is estimated as 12.8 million ha, producing 10.9 million metric tons of copra equivalent [1, 2]. India ranks third in terms of area of cultivation and coconut production next only to Indonesia and Philippines. India contributes 15.28 per cent area of cultivation and 19.44 per cent of production of coconut in global terms. India has witnessed a steady increase in cultivation area and production of coconut during the last five decades, before the invasion of *Aceria guerreronis* L here in 1998. Kerala, Karnataka, Tamil Nadu and Andhra Pradesh are the major coconut producing states and together account for about 91 per cent area as well as production within the country. Kerala accounts for almost 50 per cent of the area and 45 per cent of the production of coconut within India.

Invasion and spread of coconut mite *A. guerreronis* L has been traced across Indian subcontinent during the last couple of decades [3, 4, 5, 6]. The infested nuts are severely damaged resulting in drastic reduction of yield and adversely affecting the economy of coconut farmers. Alarming rate of destruction and need for implementation of suitable management practices have been repeatedly highlighted by our previous reports [5, 7]. Despite the implementation of control measures, the mite continued to spread into new fields and locations [8]. Continued damage caused by the mite on coconut crop has affected the economy of coconut farmers and coconut enabled industries [9]. We have tracked the population density of the coconut mite in relation to abiotic factors in order to assess their influence on population build-up of this pest.

## 2. Material and Methods

In the current study, Chowghat green dwarf variety of coconut plants growing adjacent to residential quarters and nearby houses in and around the Calicut University Campus have been chosen for population assessment of the mites. The area constituted informal plantation comprising

approximately 500 trees, of which 30 trees infested with mite were selected for continuous monitoring of mite population and grouped into 3 with 10 trees in each group. Sampling was done for 3 years between January 2011 and December 2013. Average of the population (Number of mites/cm<sup>2</sup>) in the meristematic zone (i.e. under the tepals) of the developing tender coconuts considered for assessment. Sampling has been done biweekly between 6-8 am by harvesting the infested tender nuts from the selected trees. In the laboratory, the tepals of each nut were removed, carefully and the counting area on the meristematic zone underneath the tepals was marked. Mites in the marked area of the tender nuts were counted directly for population estimation.

## 3. Results

Chowghat green variety of coconut is a commonly cultivated coconut in Kerala. Coconut mite generally invades young nuts of about 1-2 weeks of age (Fig. 1), which generally do not show any symptoms of infestation.



**Figure 1:** Tender coconuts at the time of mite invasion

First visible symptoms of mite attack is observed among nuts of 4-8 weeks of age leading to the fall of severely affected nuts, characterized by triangular white patches (Fig. 2a) and 'Y' shaped crack on the surface of the nut (Fig. 2b), near the tepals.



**Figure 2 (a):** Close up view of early symptoms of mite attack – Triangular white patches on tender nuts of 4 weeks of age.



**Figure 2 (b):** Y-shaped crack on tender coconut at a later stage of mite attack.

Dense population of tiny mites are observed below beneath the tepals of the infested nuts (Fig. 3).



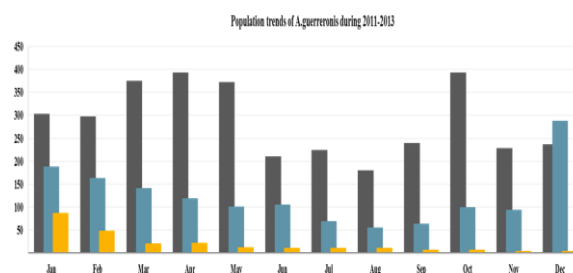
**Figure 3:** A microscopic view of the colony of *A. guerreronis* on an infestation patch on tender coconut.

The infested tender nuts exhibit stunted growth with hard grey patches bearing cracks on their surface at late stage of infestation (Fig.4).

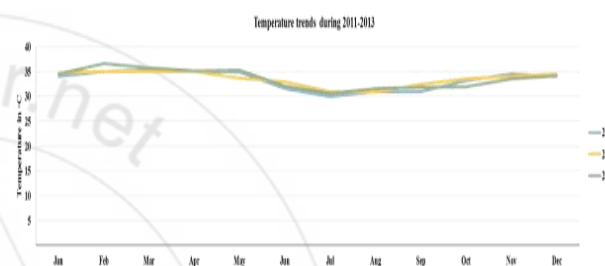


**Figure 4:** Tender coconuts with symptoms of late infestation by *A. guerreronis*.

Population density of the mites showed a visible annual fluctuation during all the three years of monitoring from 2011-2013 (Fig. 5a). During the all the three years, a population decline was recorded from June to August which regained by December. The temperature also showed a fluctuation during the period of study (2011-2013) (Fig. 5b).

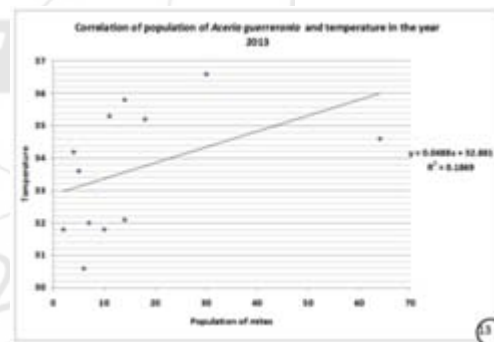


**Figure 5 (a):** Population dynamics of *A. guerreronis* on coconut during 2011- 2013.



**Figure 5 (b):** Temperature fluctuation in the study area during 2011-2013.

Correlation analysis of the mite population and temperature for the year 2013 showed a positive correlation (Fig.6).



**Figure 6:** Correlation between mite population and temperature during 2013.

Comparison of the population density of the mite over the three years starting from January 2011, showed a decline in the average density across all seasons with the lowest levels recorded during 2013 (Fig. 5a).

#### 4. Discussion

Chowghat green dwarf is a highly susceptible variety of coconut to attack by *A. guerreronis* in Kerala [9] and hence opted for the current investigation on population trends of the mite during recent years. Population density of the coconut mite is influenced by climatic factors to a great extent [10,11]. A positive correlation of the population density of *A. guerreronis* with temperature has been established during the current study. However, the final



outcome of the population trend is influenced by other factors, especially relative humidity (RH) and rainfall. The current survey on population of *A. guerreronis* has recorded surge in population during January to May, followed by a lower trend from June to August and a relatively varying tendency during September to December during the three years of observation. In Kerala, the season from January to May represents summer period with high temperature, low RH and negligible rainfall. June to August in Kerala receives the high rainfall, often with high RH as well. The period between September to December represents season with intermittent light showers and low temperature. The population trends of the mite recorded during our study comply with the earlier reports from Guerrero, Mexico [10], Brazil [12, 13], Sri Lanka [14], and other places [15], indicating positive impact of dry season on population build-up of the mite. Similar findings with a positive and significant correlation between temperature and mite population and a negative and significant correlation between rainfall and mite population were also reported from other parts of South India [16]. The adverse effect of rainfall leading to a reduction in the population density of pest mites and their predators has been in record. However, contradictory reports also exist from Benin and the Ivory Coast supporting a negative relationship between mite population and temperature, by recording 5 times the population density of the mite in wet season than that of the dry season [17]. However, our earlier studies have confirmed the adverse effect of temperature on population build-up of the mite, when it rises beyond 35°C [9, 18] by retarding the developmental process of the mite. Interestingly, a marked reduction in the population density of the mite was obvious across all the three years of study, across all the seasons. Probably, synergistic influence of all the climatic factors and increasing temperature may be favoring the defense mechanism of the host plant towards mite attack.

## 5. Conclusion

*A. guerreronis* exhibits seasonal dynamics of population density in Kerala with higher peak during January- May and lower densities during June- August. A positive correlation exists between mite population and temperature up to 35°C, beyond which increase in temperature disrupts mite population growth. A notable decline in the population of the mite is recorded from 2011-2013 across all seasons of the year, indicating the tendency of the plants gaining resistance against the mite. This phenomenon will drive the coconut farming and allied industries towards better fortunes.

## 6. Future Scope

Current study has revealed the population density status and trends of *A. guerreronis* in Kerala on the susceptible variety of coconut, Chowghat green dwarf. The study has revealed a continuing decline of population density of the mite on infested nuts since 2011. Investigation on the factors causing negative impact on population build-up of the mite needs to be done for predicting the future trends and for developing strategies for control of the mite.

## References

- [1] Arie A., Lolong and J. Mawikere ( 2003) In: Singh, H.P & Rethinam, p. (eds) Coconut Eriophyid Mite issues and strategies - Proceedings of the international workshop on coconut Mite. Coconut Development Board, Kochi, pp. 57-59.
- [2] Rethinam, P. (2003) International efforts on Coconut Eriophyid mite (*Aceria guerreronis* (Keifer)) problem - An overview. In: Coconut eriophyid mite issues and strategies, Proceedings of the international workshop on coconut mite (eds. Singh, H.P and P. Rethinam) , Coconut Development Board, Kochi, pp. 10-21.
- [3] Sathiamma. B., C.P. Radhakrishnan Nair and P.K. Koshy (1998) Outbreak of a nut infesting eriophyid mite, *Eriophyes guerreronis* (K.) in coconut plantations in India. *Indian coconut journal*, 29 (2) : 1-3.
- [4] Mohanasundaram, M. , S. Kalyanasundaram, O.V.R. Somasundaram and R. Mahendran, (1999) Management and control measures for the coconut eriophyid mite, *Aceria guerreronis* Keifer (Eriophyidae :Acari) in Tamil Nadu. *Indian Coconut Journal*, 29(9) : 8-10.
- [5] Haq, M.A. ( 1999a) Coconut Mite Threat in Kerala. *Journal of Acarology*, 14(1&2) : 58-63.
- [6] Muthiah, C., R.Bhaskaran and S. Kannianan (2001). Bio-Ecology and Control of Eriophyid Mite of Coconut- An Indian Experience. *The Planter*, 77 (902) : 255-263.
- [7] Haq, M.A.( 1999b) Distribution of the coconut mite, *Aceria guerreronis* in Peninsular India and adjacent islands. *Entomon* , 24(4): 371-379.
- [8] Haq, M.A., K. Sumangala and N. Ramani ( 2000) Coconut mite injury and distribution. In: Fernando, L.C.P., C.T.D. Moraes and I.R. Wickramananda(eds.), Proc. International Workshop on coconut mite, *Aceria guerreronis*. Coconut Research Institute, Colombo, Sri Lanka. pp 41-49.
- [9] Haq , M.A. (2001) Culture and rearing of *Aceria guerreronis* and its predators. *Entomon*, 26 (3&4): 297- 302
- [10] Mariau, D. (1969) *Aceria guerreronis*: Récent ravageur de la cocoteraie Dahoméenne. *Oléagineux*, 24: 209-272.
- [11] Otterbein, H. D. (1988) Studies on the biology, importance and control of *E. guerreronis* on *Cocos nucifera* in Costa Rica. Kiel (Germany, F.R.), 153 p.
- [12] Lawson-Balagbo, L.M., M.G.C. Gondim Jr., G.J. de Moraes, R. Hanna and P. Schausberger (2008) Exploration of the acarine fauna on coconut palm in Brazil with emphasis on *Aceria guerreronis* (Acari: Eriophyidae) and its natural enemies. *Bulletin of Entomological Research* 98: 83-96.
- [13] Reis, A.C., M.G.C. Gondim Jr., G.J. de Moraes, R., Hanna, P., Schausberger, L.M . Lawson-Balagbo and R. Barros (2008) Population dynamics of *Aceria guerreronis* Keifer (Acari: Eriophyidae) and associated predators on coconut fruit in Northeastern Brazil. *Neotropical Entomology* 37: 452-467.
- [14] Aratchige, N. S. , L. C. P. Fernando, K. P. Waidyaratne and K. A. S. Chandrasiri (2012) Population dynamics of *Aceria guerreronis* (Acari: Eriophyidae) and its predatory mite, *Neoseiulus baraki* (Acari: Phytoseiidae) in two coconut growing areas in

Sri Lanka. *Experimental and Applied Acarology*, 56: 319–32.

- [15] Yaninek, J. S, Herren HR, Guttierrez AP(1989) Dynamics of *Mononychellus tanajoa* (Acari: Tetranychidae) in Africa: seasonal factors affecting phenology and abundance. *Environmental Entomology*, 18: 625–632.
- [16] Pushpa, V. and B.S. Nandihalli ( 2009) Seasonal incidence of coconut perianth mite, *Aceria guerreronis* Keifer around Dharwad. *Karnataka Journal of Agricultural Sciences*, 22 (1) : 203-205.
- [17] Julia, J.F., and D. Mariau (1979) New research on the coconut mite *E. guerreronis* (K), in the Ivory Coast. *Oléagineux* , 34: 181-189.
- [18] Sobha, T.R., and M.A. Haq ( 2011) Postembryonic development of the coconut mite, *Aceria guerreronis* on coconut in Kerala, India. *Zoosymposia*, 6 : 68-71.

### Author Profile



**Dr. T. R. Sobha** has a Ph. D. in Zoology with expertise in Acarology. She has 20 years of professional experience in research and Teaching and currently working as Asst. Professor of Zoology at Farook College, Kozhikode. She has 18 research papers to her credit and participated and presented papers in various seminars and Conferences.



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