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Correlation studies on incidence of eriophyid mite population *A. guerreronis* with weather parameters

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ABSTRACT

A study was conducted at Department of Entomology, Annamalai University, Chidambaram, Tamil Nadu during 2000-2002. The meteorological parameters such as maximum, minimum temperatures, relative humidity, rainfall, wind velocity, hours of sunshine were correlated with mite population and correlation coefficients obtained were revealed that maximum, minimum temperature and wind velocity were positively correlated. Relative humidity, rainfall and sunshine were negatively correlated. The increase in these parameters decreased the mite population. By using the regression equations mean mite population /8mm^2 can be predicted for a given set of meteorological parameters. A unit increase in maximum temperature keeping other parameters constant resulted in increase in population of 1.31/8mm^2 area. In contrast, a unit increase in rainfall resulted in decrease in mite population of 0.83/8mm^2.

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INTRODUCTION

The coconut palm, *Cocos nucifera* L. is one of the plantation crops in the world. In Sansktrit, it is called 'Kalpavriksha' 'the tree of heaven or ''the paradise tree 'which provide all the necessities of life (Sundarajan and Thulasidas, 1993 and Nampoorthi, 1999). The eriophyid mite, *Aceria guerreronis* Keifer belonging to family Eriophyidae was unknown in Indian subcontinent till 1984, when it was first recorded from Srivilliputhur area of Tamil Nadu. In India, the mite attained a major pest status in the three peninsular states of India *viz.*, Kerala, Karnataka and Tamil Nadu and it is spreading towards Northen States (Sathiamma *et al*., 1998). Although nine species of eriophyid mites have been reported to attack coconut leaves and nuts, feeding on tender nuts has been found to be cause heavy damage, resulting in the loss of production of nuts. Coconut is extensively cultivated in 80 countries of the world with a total production of 54,129 million nuts from an area of about 120 million hectares (Nair and Rajesh, 2001). India is in the forefront among the coconut growing countries in the world. In India, this plantation crop is grown in 2140.50 million hectares producing 21665.19 million nuts with productivity of 10122 nuts per hectares (CDB, 2013). This crop contributes Rs.7000 crores to the gross domestic product of the

country and earns valuable exchange to the extent of 313 crores by way of export of coir and coir products. Six per cent of vegetable oil consumption is met out by this crop. Among the various non insect pests that have been reported on coconut palm, eriophyid mite, *Aceria* [Erophyses] g*uerreronis* Keifer (Acari: Eriophyida) is a serious one in Southern States in India. They generally suck the sap from the meristematic tissue of the nuts resulting in the loss of production of nuts (Kannaiyan *et al.*, 2000). An eriophyid phytophagus mite, *Aceria guerreronis* Keifer was first described in 1965 from coconuts of Guerrero State, Mexico (Keifer, 1985). In the Indian sub continent, it was first reported from Srivilliputhur area of Tamil Nadu 1984 (Sathiamma *et al.*, 1998).The estimated average loss in copra yield due to mite infestation was found to be 10-15 per cent in Tamil Nadu as compared to 10 per cent in Mexico and 11-18 per cent in St. Lucia (Moore and Howard, 1996).The coconut mite was found in tropical and subtropical climates, but populations could survive both short period of frost and period of temperature just above 0ºC (Zuluaga and Sanchez, 1971).The presence of mites in the nut was evident round the year with a slight reduction during the rainy season (Subharan *et al.*, 2001). The pest occupies a wide area in the entire Kerala State and also in many pockets in adjacent states like Tamil Nadu, Karnataka and Andhra Pradesh in South India. Observations on the seasonal abundance of the mite showed the persistent nature of the pest with the population peaking in summer months (April May) (Nair, 2000).

MATERIAL AND METHODS

The study was made from November 2000 to December 2000 in coconut at Kadavasal village. Field samples were collected at fortnightly intervals. The experiment was laid out in Randomized Block Design

Table 1 : Incidence eriophyid mite *A.guereronis* during November 2000 to 2001

Month	Fort night	Temp. (ºC)#		Relative humidity#	Wind velocity (km/hr)#	Hours of bright sunshine#	Rainfall (mm)#	Mean mite population (mm)
		Max.	Mini.					
Nov., 2000	I	31.15	24.07	79.71	3.91	9.31	2.70	189.76
	II	29.62	23.54	82.40	4.55	8.57	17.01	186.86
Dec., 2000	I	29.20	22.94	82.00	5.10	7.60	2.07	188.23
	II	28.34	20.14	72.57	6.00	9.92	0.00	185.66
January 2001	I	28.28	22.41	81.28	4.51	8.14	1.15	184.59
	II	28.20	21.71	79.00	5.18	7.31	0.00	187.83
February 2001	I	29.98	21.48	50.17	3.28	8.27	0.00	191.83
	II	30.77	18.80	75.71	2.77	10.34	0.00	193.89
March 2001	I	31.21	21.60	74.71	3.21	10.02	0.00	182.33
	II	32.14	21.67	74.85	2.95	9.64	0.00	190.39
April 2001	I	33.14	25.08	76.85	4.84	8.86	0.00	201.79
	II	32.37	25.21	8.14	4.78	4.12	2.48	201.15
May 2001	I	36.67	26.48	68.57	7.98	10.68	7.45	221.86
	II	37.27	27.67	64.42	8.91	0.30	0.08	217.56
June 2001	I	32.41	25.41	75.00	5.11	2.68	9.35	209.46
	II	34.27	25.72	66.28	8.76	4.73	0.00	211.03
July 2001	I	37.28	27.48	58.28	7.92	2.60	7.47	207.28
	II	36.85	26.42	60.71	.14	5.10	6.38	183.03
Aug 2001	I	33.18	24.57	71.42	6.10	3.60	3.85	184.80
	II	34.98	26.00	66.71	6.80	4.20	9.07	181.73
Sep 2001	I	36.41	25.42	64.85	5.87	5.10	9.05	178.62
	II	26.14	24.42	69.57	4.95	3.60	9.35	178.73
Oct 2001	I	32.34	24.87	76.42	3.87	3.58	4.67	176.66
	II	32.04	25.08	83.42	3.37	5.70	5.98	180.69

Values of fortnightly observations

Table 2 : Simple correlation matrix between the incidence of *A.guerreronis* and weather factors

	X_1	X_2	X_3	X_4	X_5	X_6	X_7
X_1	1.000						
X_2	0.733*	1.000					
X_3	-0.387*	-0.137*	1.000				
X_4	0.651**	0.692**	-0.294*	1.000			
X_5	-0.108*	-0.199*	0.170*	-0.289	1.000		
X_6	0.153*	0.432*	0.111*	0.163*	-0.245	1.000	
X_7	0.492	0.410	-0.126*	0.489	-0.124	-0.110	1.000

X_1-Maximum temperature (ºC) X_2-Minimum temperature (ºC) X_3-Relative humidity (%)
X_4-Wind velocity- (km/hr) X_5-Rainfall (mm) X_6-Hours of bright sunshine

Table 3 : Prediction model for incidence of mite *A.guerreronis* 2000-Oct 2001

Sr. No.	Infestation yard sticks	Regression coefficient (b)						Intercept (a)	Regression equation	Coefficient of determination
		bx_1	bx_2	bx_3	bx_4	bx_5	bx_6			
1	Mite population /8mm^2	1.311	0.678	-0.182	1.701	-0.158	-0.825	116.1391	$Y=116.1391+1.311X_1+0.678X_2-0.182X_3+1.701X_4-0.158X_5-0.825X_6$	0.361

X_1-Maximum temperature (ºC) X_2-Minimum temperature (ºC) X_3-Relative humidity (%)
X_4-Wind velocity- (km/hr) X_5-Rainfall (mm) X_6-Hours of bright sunshine X_7- mite population
Y=Mite incidence (8mm^2) R^2-Co-efficient of determination b-Regression co-efficient

with three replications, each replication comprising of one palm which was maintained unsprayed. In such selected trees, third bunch from top was selected. From the selected bunch, one nut was taken at random and observations on number of mites per 8mm^2 area at three places were recorded and mean population was assessed.

Method of mite population count :

The nuts were collected from the treated bunches and population of mites were determined by "cello tape embedding technique" (Girija *et al.*, 2001). In this technique, the perianth was removed from the button mechanically. A transparent cello tape of one inch width was taken and 8 mm^2 areas were marked on the cello tape by using permanent marker pen. Then the cello tape was embedded on the nut surface. Population of mites was counted immediately after removing the perianth without disturbing the colony by keeping the slide under a Stereo microscope at 10X magnification. Counting was done using the hand tally counter. The mites that got adhered in the cellotape were counted to arrive at the total population of mites in 8 mm^2 square area. For comparison of all the treatments, Duncan's Multiple Range Test was adopted (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

The results present in the table revealed that maximum, minimum temperature and wind velocity were positively correlated. Relative humidity, rainfall and sunshine were negatively correlated. The increase in these parameters decreased the mite population. By using the regression equations presented in Table 3. Mean mite population /8mm^2 can be predicted for a given set of meteorological parameters.An unit increase in maximum temperature keeping other parameters constant resulted in increase in population of 1.31/8mm^2 area. In contrast, a unit increase in rainfall resulted in decrease in mite population of 0.83/8mm^2.

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